RAILROAD GAZETTE

FRIDAY, NOVEMBER 5, 1897.

CONTENTS

ILLUSTRATIONS:	PAGE.
Special Tools in the Missouri Pacific Shops	778
Ten-wheel Passenger Locomotive — Pittsburgh & Western	779
Poling Yard of the Michigan Central, at East Detroit	780
Improvements on the Baltimore & Ohio	781
Application of the Storage Battery to Electric Traction	782
CONTRIBUTIONS:	
The "Facility" of Electric Traction	777
How to Get into Railroading	777
EDITORIALS:	
British Railroad Employees	785
Annual Reports - Missouri, Kansas & Texas	785
EDITORIAL NOTES	784, 785
New Publications	785
Trade Catalogues	786
GENERAL NEWS:	
Locomotive Building	788
Car Building	788
Bridge Building	789
Meetings and Announcements	789

GENERAL NEWS:	PAGE.
Personals	789
Elections and Appointments	790
Railroad Construction	790
Electric Railroad Construction	791
General Railroad News	791
Electric Railroad News	792
Traffic	792
MISCELLANEOUS:	
Technical	787
The Scrap Heap	788
A Ship Canal from the Lakes to the Sea	777
Increased Traffic on the South Side Elevated, Chicago	779
The Chief of the Coast Survey	780
Mr. Knapp on the Powers of the Interstate Commerce Commission	780
Schenectady 12-Wheelers for the Butte, Anaconda & Pacific	780
Combined Rack Rail and Adhesion Locomotives.	781
Street Railroad Improvements in Baltimore	783
Mr. Blanchard on Trusts	786
Continental Express Speeds and Accommodation	786

Contributions.

The "Facility" of Electric Traction.

TO THE EDITOR OF THE RAILROAD GAZETTE:

In my articles on "Suburban Competition," it was my aim to make it clear to railroad men, that the great advantage to be looked for in using electric power is *facility*. Since the change from horses to steam power no great increase of power can be looked for, and it is not with a hope for an increase of power, or greater economy, that we turn to electricity, but for the facilities that enable us to carry more passengers and induce those people to ride, by offering them conveniences, and thus we increase our income without proportionally increasing expenses. So it is with especial satisfaction that I can now call the attention of railroad managers to the corroboration of the above views by N. H. Heft in his paper presented at Niagara Falls in October, where he shows the experience of the N. Y., N. H. & H. R.R. with electric traction. He tells of the reduction of fares to less than one half by carrying five times as many passengers.

Mr. Heft says: "I do not suppose that any but a trained railroad man can understand the impossibility of operating trains and maintaining schedules by steam locomotives in the way that has been done by electricity at Nantasket Beach this summer. . . . There are no less than 17 stations on a line only 10.6 miles in length. To make a run of 10 miles with 16 stops in 26 minutes; to be obliged to do this in order to connect with boats arriving at regular half-hour intervals, and to keep out of the way of frequent regular steam trains on the main line of the Plymouth Division; to allow but four minutes at each end for unloading, switching and loading, and to do this day in and day out in regular service, through an entire summer—these are things that cannot possibly be accomplished by steam locomotives." C. J. BATES.

How to Get into Railroading.

CHICAGO, June 22. 1897.

TO THE EDITOR OF THE RAILROAD GAZETTE:

I am 30 years of age, a graduate in civil engineering, class of 1890, and have been doing engineering work since that date. I was two years in the office of —— on designs and estimates for foundations of bridges and buildings, tunnels, water power development and other matters occurring in the practice of a consulting engineer. I was for over four years with an elevated railroad—three years in charge of surveys, location of right of way and structure, car construction, track details, etc., and one year in charge of construction of branch and two elevated storage yards. I have also done some structural steel detailing.

My interest in car and track matters and in the discussion of operating questions which came up in connection with my work led me to join the Western Railway Club some two years ago. Since then I have studied, as best I could, the railroad matters coming to my attention and have about decided to leave such work as I have been doing, to give my attention to a railroad training by working from the bottom up in some organization.

Would it not be best to start in the train service? It would seem that I could absorb a great deal of the work of construction and maintenance, by reason of my previous training. Are there office positions which I could fill at the start and which would give me the advantage of acquaintance and of greater variety of detail, or would it be best to learn details by actually handling them? My intention would be to add to experience by studying in subjects outside of the particular work in hand, and I think it may be said, in view of what I have undertaken in the past, that I can learn in that way as fast as most men.

If you can suggest a "course of training" to be applied in actual railroad work I shall be under great obligations. I do not know yet if it is advisable for me to abandon fair prospects in my legitimate profession for the work above mentioned above. Nor do I know how to get into railroading advantageously.

C.

A Ship Canal from the Lakes to the Sea.

By the River and Harbor Act of 1896 the Secretary of War was directed to cause a survey and estimates to be made for a ship canal from the Great Lakes to the navigable waters of the Hudson. In due course this duty was devolved upon Major Thomas W. Symons, Corps of Engineers, U. S. A., stationed at Buffalo, and his report, with plans, profiles, sections, drawings of vessels and other valuable information, is now before us. From the abstract which was made public some weeks ago we were able to give the main conclusions of the report. These we shall repeat briefly and then examine the report in some detail.

It must be understood at the outset that there was not money enough available for a thorough survey, and therefore it was decided to treat this inquiry as a preliminary examination and to confine the cost of it within $5,000. Obviously a complete study could not be made for that sum—or anything near it. Indeed, Major Symons estimates the cost of a survey for the two projects of the Niagara-Oswego ship canal and the Erie Canal enlargement at $250,000, and the Chief of Engineers endorses this estimate.

Major Symons concludes that a ship canal for the largest lake vessels would cost $200,000,000, and its working and maintenance would cost $2,000,000 a year. But to enlarge the Erie Canal to take 1,500-ton barges, to make a continuously descending grade from Lake Erie to the Hudson and to canalize the Mohawk would cost probably about $50,000,000.

If the ship canal were built it would not be used by large lake or ocean ships but by craft that could be accommodated in the barge canal.

The ship canal would have no military value.

The ship canal is not a project worthy of being undertaken by the general government, as the benefits would not be commensurate with the cost.

The enlargement of the Erie Canal, as suggested above, is a project worthy of being undertaken by the general government, as the benefits would be properly commensurate with the cost.

We will now try to show fairly how the conclusions of the report are reached, but cannot undertake to do justice to the valuable document in the space that we can give to it. It is so scientific in method, and so temperate and judicious in reasoning, that it takes place as one of the few really useful papers in all the windy literature of this popular subject.

Three possible routes (entirely within the United States) are considered. The first is from Lake Erie to Lake Ontario by a lock canal descending 326 ft. through Ontario to Oswego; through Oneida Lake and over a divide 172 ft. above Lake Ontario to the Mohawk; down the Mohawk to Troy and so to New York by the Hudson. This is called the Oswego route.

The second route follows the line of the Erie Canal (or this line modified to a continuous down grade) from Lake Erie to the Hudson.

The third route is to Lake Ontario, down the St. Lawrence to Ogdensburg, across the state to Lake Champlain, thence north by the lake and the Champlain Canal to Troy. This is mentioned as possible, but is not thought practicable.

It is thought proper to mention another route—down the St. Lawrence to Chaughnawana, across to Lake Champlain, thence to the Hudson as in the third route. This route is not all in the United States territory, and therefore is ruled out of the consideration. It is called the St. Lawrence-Champlain route.

All of these routes are described with some particularity and with a synopsis of the history of the various projects. The Erie Canal route has the least possible amount of lockage; the least number of locks; a safe water supply and the bulk of the traffic is down hill. But it would have considerable aqueducts, culverts and drawbridges and heavy land damages. The Oswego route has a large amount of lockage, many locks, and water supply at the summit level may be very expensive. Altogether, Major Symons thinks the Oswego route best for a ship canal, and the Erie Canal route best for a large barge canal, for reasons which the reader will see from this brief of his analysis, and because of existing rights and property, and further because it would admit of navigation by a class of lighter and cheaper vessels than can navigate Lake Ontario. The St. Lawrence-Champlain route has immense disadvantages compared with the Oswego route. It is 244 miles longer, it is exposed to attack from Canada, it would foster Canadian commerce and reduce our preponderance on the lakes, which would be a military as well as commercial disadvantage. Of the lake tonnage, we now have 89 per cent. and Canada 11 per cent. On the ocean the United Kingdom has 10 times our tonnage. Apparently the result of building a ship canal which would communicate directly with Montreal would greatly change the ratio of the lake tonnage of the two countries, and the injury to some American interests might exceed the benefits to any others.

Major Symons points out that in discussing this matter of the ship canal great stress is laid upon the effect on foreign-bound commerce and little is said of domestic commerce. This is exactly what we should not do. For example, in 1895, only $\frac{1}{18}$ of the cereal crop went out of the country; of the cereals which reached the great out-ports, only 58 per cent. was exported. In most of the other items of tonnage possibly tributary to a ship canal the relative value of the domestic market is still greater. So "from the standpoint of tonnage alone the domestic freight feature of a ship canal is of much more importance than the foreign. . . . A canal which cheapens transportation only on foreign-bound produce benefits chiefly the producer, one which cheapens transportation in products used at home benefits both producer and consumer."

In estimating the cost of the canal one must begin with its dimensions, and for the ship canal Major Symous has assumed a ship 500 ft. long, 50 ft. broad and 20 ft. draft. The lake harbors and channels govern the profitable draft of the ships and it is believed that 20 ft. will be the maximum draft of those harbors for many years if not forever (humanly speaking). To pass these ships without interference with each other and at "fair canal rates of speed," the canal will have a bottom width of 138 ft., a slope of 1 to 1½, and carry 24 ft. of water. A barge canal, for barges of 30 ft. beam, 10 ft. draft and carrying 1,500 tons, would have 12 ft. of water and be 82 ft. wide on the bottom, with slopes of 1 to 1½. These are the canals (as to dimensions and routes) which it is supposed will cost $200,000,000 and $50,000,000 respectively, but, of course, these estimates of cost are not put out as anything more than approximations.

What tonnage may we count on to pay working expenses, maintenance and interest on these enormously costly canals? Here again we can get only a more or less judicious estimate.

In the first place the open season is limited to about 224 days. Again, although a through water route exists and carries the products of the West at less charge than the railroads, yet the railroads do by far the greater part of the business. Thus, in 1895 the rate on wheat, Chicago to New York, was, per bushel, 10 cents all rail, 5.9 cents lake and rail and 4.98 cents lake and canal; but of the grain, flour and meal carried to New York 86.8 per cent. was by rail. Even during the seven months of open navigation 82.9 per cent. was by rail. Of the grain that left Chicago for the seaboard by lake at least three-fourths was transhipped to cars at the lower lake ports and not more than one-fourth was sent on by canal.

Some of the reasons why the railroads get this big share of the course freight through from the West would disappear with better water facilities; most of them would not. The railroads can deliver the freight in less time and can do it regularly all the year through. They send their cars and their agents into the interior and secure the freight where it originates, and further "railroad freights in this country are really very low intrinsically and as compared with similar rates in other countries." Again, the business energy and skill of the great body of able men who serve the traffic departments of the railroads must be taken into account, and this is compared with the want of organization and business skill in conducting the canal traffic, which itself is largely the result of the fact that the canal traffic must be done by small owners, as the absurd law of the state of New York now stands. But there is still another important reason in the fact that a large part of the Western products going East never reaches the sea coast, but is distributed into the interior by rail.

An attempt is made to estimate the tonnage that might be tributary to a ship canal and from which fixed charges and working expenses are to be earned. This must naturally be only an estimate more or less judicious. Major Symons arrives at a total of 24 million tons. This tonnage is not now in sight, but perhaps it can be reached by the further development of agriculture and various industries and by the diversion of business from the railroads. It is predicted on the assumption that the ship canal is built by the shortest and best route from the Lakes to New York. If it should go by way of St. Lawrence to Montreal with a Champlain branch to New York no such tonnage could be obtained.

Granting that there might be 24 million tons to carry, what kind of vessels can best do the work? This part of the report is a very interesting analysis, the sum of which is that it is not believed that the highest and most profitable type of lake vessels can be used at sea, especially in the North Atlantic trade, or that ships fitted for use at sea can successfully compete in freight business on the lakes, and furthermore, that the traffic from the lakes to the seaboard can be more advantageously done by a special service of barges than by either ocean or lake steamers.

A ship designed for service on the lakes and the ocean must be a compromise between two widely different types. It cannot carry cargoes on the lakes as cheaply as the lake ships or on the ocean as cheaply as the ocean ships; and, assuming that the advantage of saving transhipment will more than make up for these disadvantages, and for the time that the ship would lose in canal, she would have this advantage only a little more than half a year; the rest of the year she must run on salt water at a loss as compared with other ships. It is believed that even if a ship canal were built to pass vessels from the lakes to the ocean, and this by large ships, as a general thing these would be lake freighters, and

their cargoes would be transferred at the seaboard. We cannot go now into the very interesting comparison of the ocean freighter, the lake freighter, the whaleback, and the possible development of a canal barge, but the estimated cost of these vessels per ton of carrying capacity is as summed up in the table below:

Steel ocean steamers	$60 to $70
Steel lake steamers	35 " 50
Erie Canal boats, plain	9 " 12
" " " in fleets with steamer	12 " 20
1,500-ton barges, plain	8
" " " in fleets with steamer	10 " 11

From these figures it follows that ocean and lake steamers would have a very heavy handicap of first cost. interest and maintenance charges when they come into comparison with canal barges, and naturally the next thing to consider is whether or not there are other elements of cost to offset these.

The methods and cost of handling freight of various sorts at the lake ports are analyzed with the conclusion that there will be considerable reduction in cost of transshipment, which, of course, would work in favor of the barge line. We have not space to enter into any report of this analysis, but shall hope to make a special article on this subject later.

Having a ship canal that will cost 200 million dollars, maintenance and operation would cost $2,000,000 a year and interest at 3 per cent. would bring this total up to $8,000,000. With 24 million tons of freight possibly tributary there must be a saving of 33⅓ cents on each ton, or, say, one cent. a bushel on wheat, to pay the yearly charges on the cost of the canal.

If the freight were carried in 5,000-ton and 7,000 ton ships there might be a saving as compared with the present Erie Canal, on 24 million tons, of about $9,000,000 a year, which would pay interest and working expenses, which indeed might create a new traffic movement, as the existing canal could not possibly handle such a tonnage. Even were the transfer charges at Buffalo reduced to ¾ of a cent. a bushel, as it is believed they can be and will be reduced, the advantage would still be with the ship canal over the present Erie Canal. There would still be a mean saving by the 5-000 ton and 7,000-ton ships of $5,600,000 a year.

But with the Erie Canal improved as the State of New York now intends to improve it, the advantages of a ship canal will largely disappear. With present transfer charges there would be an advantage on the side of the ship canal of about $720,000, but with the transfer charges reduced to three quarters of a cent a bushel the gain would be transferred to the side of the small canal, which would have an advantage of something like $2,640,000 a year.

But when we compare the ship canal with the Erie Canal radically improved, to take fleets of 1,500-ton barges, a great advantage appears on the side of the barge canal. With transfer charges as they are now this canal would save on the assumed tonnage $3,840,000 over the ship canal; with transfer charges reduced, as it is expected they will be, the saving would be $7,200,000 a year. But if the barge canal is worked something as the coastwise coal barge business is now done a still greater economy would be introduced.

Such a barge canal would take barges of a size sufficient to go anywhere on the Lakes with safety. Thus it would force down transfer charges at any point to a minimum. As it would cost not more than one-quarter as much as the ship canal the double advantages of low first cost and economy in service become very great.

In the opinion of Major Symons a ship canal is not needed for its military advantages. In case of war with Great Britain none of our warships could leave the sea coast for service on the Lakes. We would need all that we have, and many more, on the ocean. An English naval force could only reach the Lakes through the St. Lawrence and the canals, which are subject to attack at many points. Furthermore, with our vastly greater merchant marine on the Lakes we should have an overwhelming advantage if these were armed for military operations. If the government would provide at different lake ports stores of arms and war material and arrange for taking possession of and arming and manning the best of the lake vessels, an American naval force could be improvised which would greatly preponderate over any which could be brought to oppose it. As long as the lake commerce is so largely in the hands of Americans a ship canal is not needed for military purposes; and on the other hand, the building of such a canal, which would open the lakes to the merchant shipping of the world, would have the effect of reducing our superiority on the lakes.

In the synopsis which we have given above we have tried to give a clear and compact notion of the method of investigation and argument of this report, and we shall hope to publish some extracts from it of especial interest in a later issue.

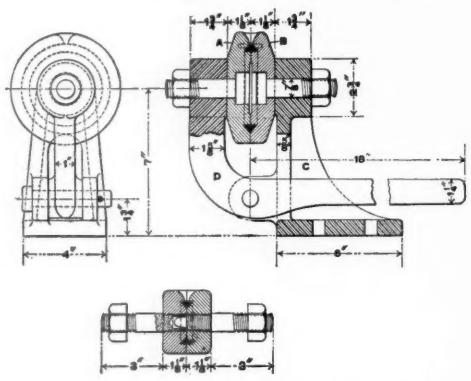


Fig. 1.—Molds for Casting Piston-Rod and Valve Stem Packing Rings—Missouri Pacific.

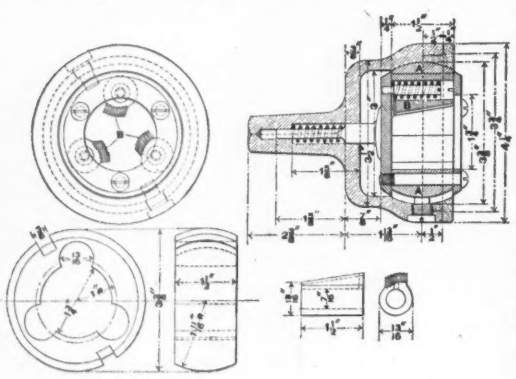


Fig. 2.—Chuck for Screwing in Staybolts—Missouri Pacific Shops.

Special Tools in the Missouri Pacific Shops.

Molds for Piston-rod Packing.—The cost of making the metallic packing rings for the engines on the Missouri Pacific has been cut down to about the lowest possible notch by the use of molds, in which they are cast and from which they are taken ready for application to the engine with the exception of boring out and splitting. The mold is made of two pieces, *A* and *B*, fastened to the upright *C* and the bellcrank *D*, as shown in Fig. 1. The lever of the bellcrank is of such length that a man can exert sufficient pressure with one hand to hold the faces of the two molds together, while with the other hand he pours the metal. As soon as the ring has solidified the lever is raised and the piece drops out. The large molds shown in position are for casting piston-rod rings, and the small ones at the bottom of the engraving for valve-stem rings.

Chuck for Screwing in Staybolts.—Where an electric motor or power from a flexible shaft is obtainable the chuck for screwing in staybolts, shown in Fig. 2, is a handy tool. The power is applied to the taper shank in any convenient manner. The head of the chuck is set over the end of the staybolt, which is gripped by the teeth of the dogs *B*, so set that the harder the pull the more tightly they grip the staybolt. They are set loosely in a head that forms a ball and socket joint in the shell or casing so that the inequalities of the motion of the chuck or staybolt are compensated and there is no danger of binding and bending. The head *A* is driven by a set screw entering a slot on one side as shown.

Equalizer Clamp.—It is well known that a very extensive application of compressed air has been made in these shops and among other conveniences is that of the equalizer clamp. It consists of two strong levers *A* and *B*, Fig. 3, 1¼ in. thick supported on a light iron frame and inter-fulcrumed with each other in a pair of adjustable straps *C*, having an adjustable bearing point for the lower bar. Between the outer ends of the levers there is an air cylinder 12 in. in diameter whose piston rod has a socket bearing against the end of an adjusting screw in the upper lever. The operation is very simple, for when air is admitted, after adjusting the apparatus in position, the outer ends of the levers are pushed apart and the inner ends brought together like a pair of nippers and the equalizer and spring forced into such a position that the hanger can be put in place and the key inserted. The adjusting holes for carrying the weight, in the floor stand, together with those in the fulcrum straps *C* coupled with the adjusting screw *D* in the upper lever, makes one clamp available for use on all classes of engines.

Pneumatic Dolly Bar.—Another compressed air tool that serves to assist in securing good work is a pneumatic dolly bar for holding against rivet heads. To hold a dolly bar all day is not only very monotonous, but very wearisome work, that is apt to be relaxed in its efficiency after several hours of application. The pneumatic bar not only renders the work of the attendant very much lighter, but holds the rivet more firmly than could possibly be done by hand. The engraving, Fig 4, shows the construction of the tool so clearly that only a brief description will be required. The heads *A* and *D* setting over the rivet and acting as the heel are slipped over pins on the ends of the bar and are held in position by split pins. The bar itself consists of a piece of heavy pipe turned to 2 11/16 in. outside diameter and having heavy heads welded into the ends. To one end there is a cup packing attached, and this is fitted into a cylinder formed of pipe with one head welded in and bored to a diameter of 3 in. A ring fastened to an adjustable clamp clasping the cylinder serves to carry the weight, and is so located that the bar balances. Air is admitted and exhausted at *C*. With the head *A* against the rivet, air is admitted, and the head *D* is at once thrown against an old man or other form of backing, and a far greater and steadier pressure brought against the rivet than could possibly be obtained by hand.

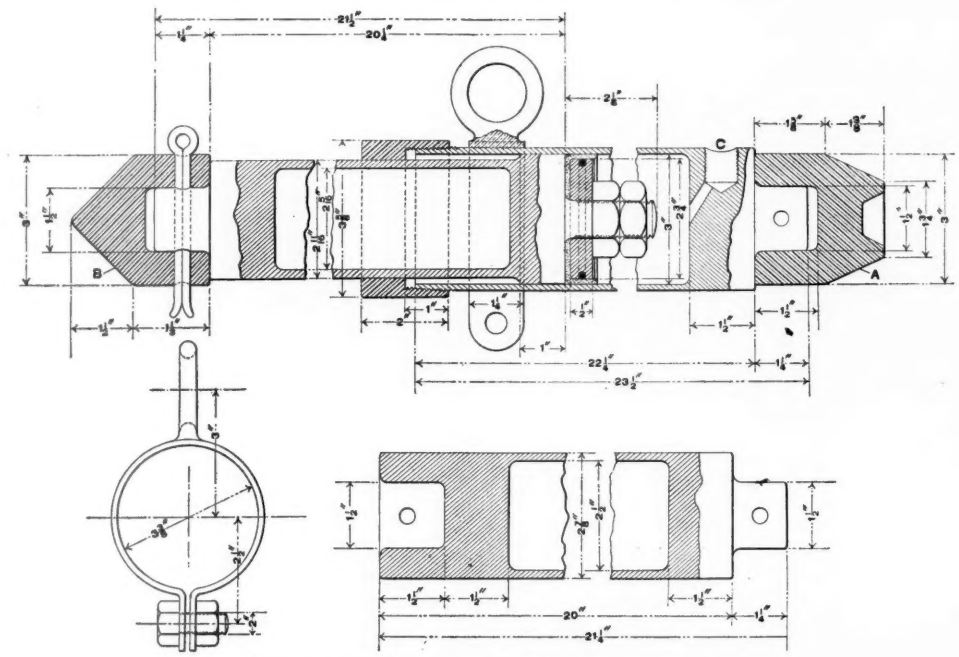


Fig. 4.—Pneumatic Dolly Bar—Missouri Pacific Shops.

Flue Expander.—The rolling out of flues is apt to be a slow process, unless it is done by the piece, and then there is danger of careless haste. This expander minimizes the labor and can be made to work with great rapidity. The rollers *A A*, Fig. 5, are set in position in the usual way. The turning is done by power derived from any convenient source, the attachment being made at the clutch *B*. This clutch is screwed upon a ⅝-in. shaft, to which the pinion *C* is keyed. This pinion has 15 teeth of ¼-in. pitch and 1¼-in. face, and meshes, with the gear *D* having 58 teeth. As will be seen from the sectional engraving, the metal of this gear extends out in the form of a hub for 6¾ in. back of its own face, and

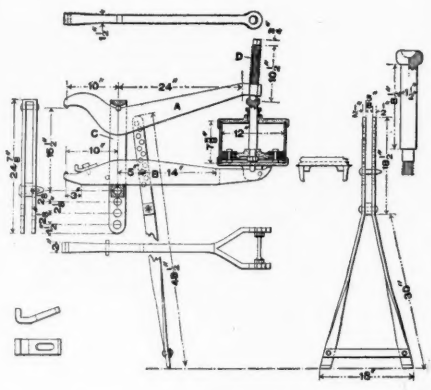


Fig. 3.—Equalizer Clamp—Missouri Pacific Shops.

this forms the bearing for the mandrel. A face plate, *E*, to which a handle for steadying the expander is attached, covers the gearing and holds them in position, so that the only visible revolving parts are the clutch and the gear hub. The expanding is done by tapping the end of the mandrel with a hammer, and thus driving it in between the rollers to force them out. The capacity of the machine is about 150 tubes an hour. One expander can be made to serve for all sizes of locomotive flues by merely making a change in the rollers and mandrel.

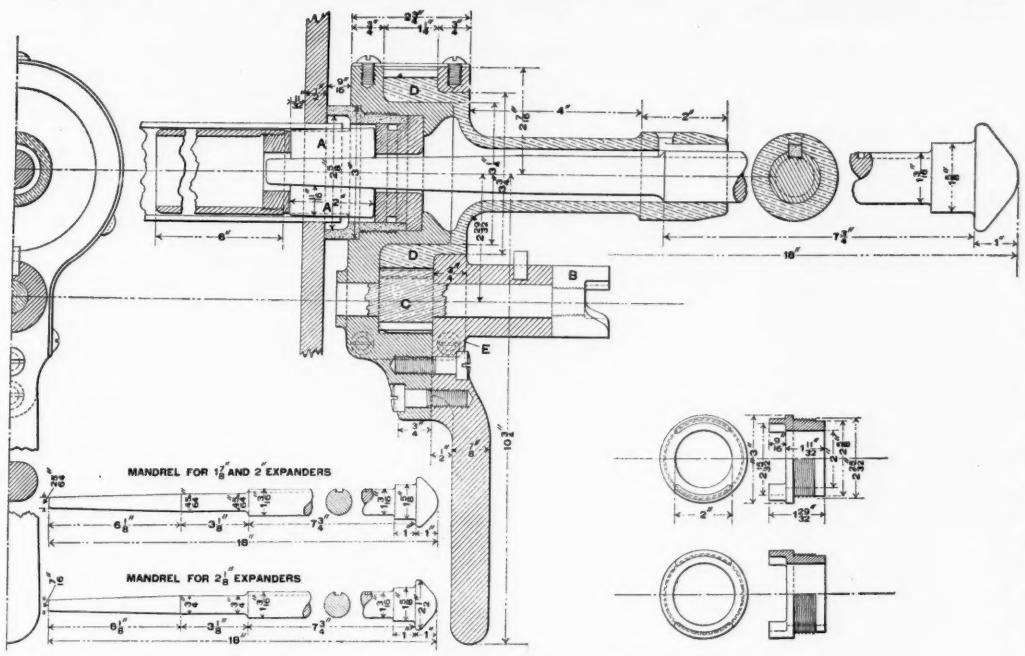


Fig. 5.—Flue Expander—Missouri Pacific Shops.

Ten-Wheel Passenger Locomotive for The Pittsburgh & Western.

The photograph shows a new ten-wheel passenger engine built by the Pittsburgh Locomotive & Car Works for the Pittsburgh & Western Railway. The locomotive weighs 145,000 lbs. in working order, 113,000 lbs. of which is on the drivers. The boiler is of the extended wagon-top type with 2,119.3 sq. ft. of heating surface. Bituminous coal is used, and the grate area is 31.5 sq. ft. The cylinders are 20 in. in diameter by 26 in. stroke. The driving wheels are 68 in. in diameter. The engine will be used to haul the Baltimore & Ohio's fast trains over the Pittsburgh & Western road. There are no special features about the engine to note particularly, except its general good proportions and design. The general dimensions and weights are:

Fuel	Bituminous coal
Gage of track	4 ft. 8½ in.
Total weight of engine in working order	145,000 lbs.
" " " " on driving wheels	113,000 lbs.
Driving wheel base of engine	13 ft. 8 in.
Total " " " "	24 ft. 6 in
" " " " and tender	51 ft. 9½ in
Height from rail to top of stack	14 ft. 7¼ in.
Cylinders, diameter and stroke	20 × 26 in.
Piston rods (steel)	3½ in. diam.
Diameter of boiler at smallest ring	60 in.
" " " " back head	71⅛ in.
Crownsheet supported by radial stays	1⅛ in. diam.
Staybolts, 1 in. diam., spaced 4 in. from center to center.	
Number of tubes	231
Diameter of tubes	2¼ in.
Length of tubes over tube sheet	14 ft. 6 in.
" of firebox, inside	108 in.
Width " " "	42 in.
Working pressure	180 lbs.
Kind of grates	Cast-iron, rocking
Grate area	31.5 sq. ft.
Heating surface in tubes	1,961.3 "
" " " firebox	158 "
Total heating surface	2,119.3 "
Diameter of driving wheels outside of tires	68 in.
" and length of journals	8 × 10 in.
" of truck wheels	32 in.
" and length of journals	5 × 10 in.
Slide valves, type of	American balance
Type of tank	Level top
Water capacity of tank	4,000 U. S. gals.
Fuel " " "	280 cu. ft.
Weight of tender with fuel and water	77,000 lbs.
Type of brakes	Westinghouse American.
Westinghouse train signal.	

Increased Traffic on South Side Elevated, Chicago.

Since Oct. 18, when the South Side Elevated road began using the new Union Loop, a most satisfactory increase in the number of passengers carried has been shown. The stations showing the largest percentages of gain are those between Twelfth and Thirty-ninth streets, which are comparatively near the center of the city. While the city terminal of the South Side road was at Congress street, the most convenient way for people living between Twelfth and Thirty-ninth streets to reach the business and shopping center of the city was by the cable roads, but now that the elevated uses the Loop it has a marked advantage, as it not only reaches the business center but makes the run in better time. The stations showing the next largest increase in traffic are those where connections are made with the electric roads from the more distant suburbs, such as South Chicago, Blue Island and Englewood. The following table gives the daily number of passengers carried from Oct. 18, when trains began running around the Loop, to Oct. 27 inclusive:

Oct. 18	47,940
" 19	45,795
" 20	46,239
" 21	46,912
" 22	46,206
" 23	56,633
" 24	44,481
" 25	50,981
" 26	47,045
" 27	47,230
Total for 10 days	479,462

Or a daily average of 47,946. From Oct. 1 to 17 inclusive (before the road began using the loop) the daily average number of passengers carried was 32,327, so that the daily average increase is 15,619, the percentage of increase being 48.3.

The gain in traffic by portions of the day from Oct. 18 to 25 inclusive, 8 days, was as follows:

	Per cent.
Night, 12 midnight to 5 a. m.	30
Morning, 5 to 9 a. m.	46
Shopping, 9 a. m. to 3 p. m.	53
Afternoon, 3 p. m. to 7 p. m.	49
Evening, 7 p. m. to Midnight	41

This table shows that the greatest increase in per cent. of gain is during the shopping hours, which is also shown by the number of passengers carried on Monday Oct. '25, 50,981, Monday being the great shopping day in Chicago. The total of 56,633 for Oct. 23 has not been accounted for by any special circumstance.

The intervals between trains, week days and Sundays are shown in the following tables:

WEEK DAYS.

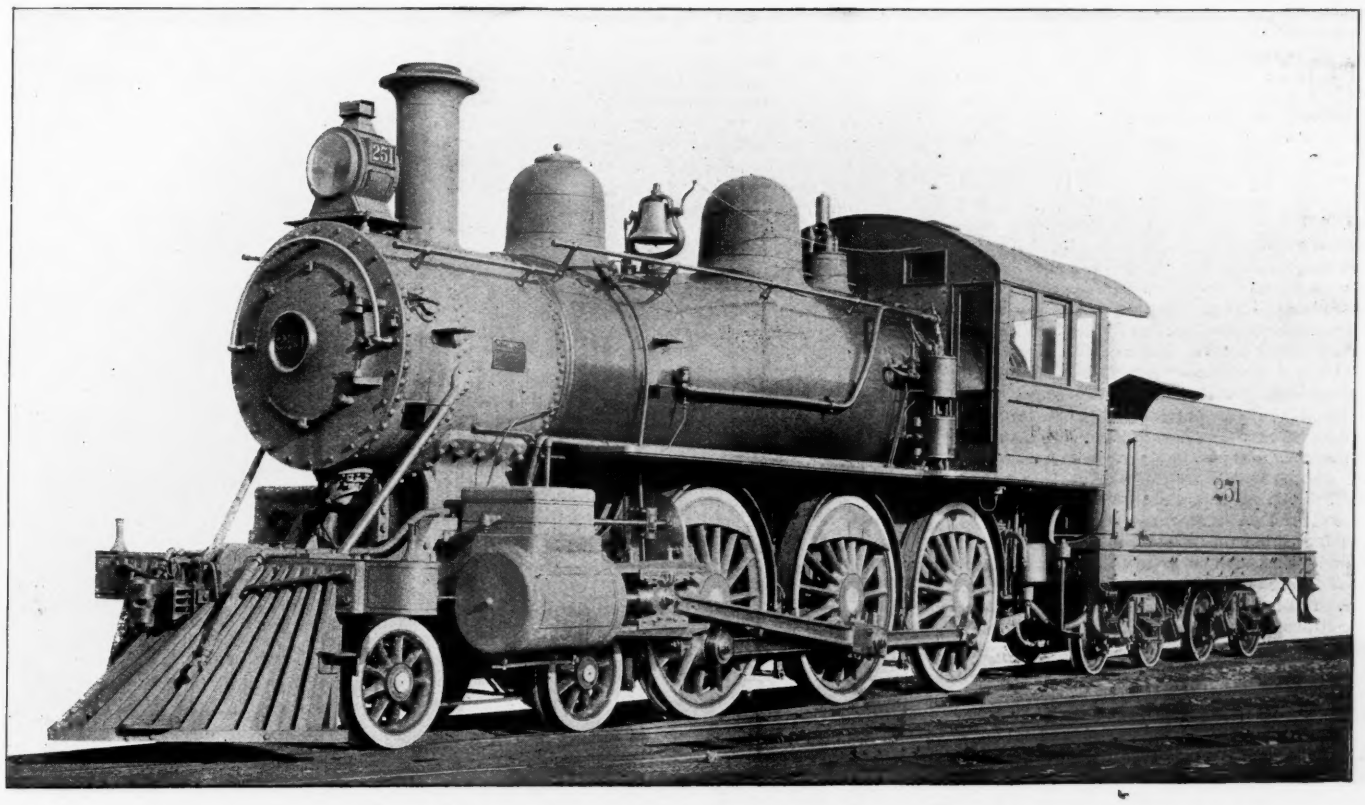
From	6:30 a. m.	to	9:30 a. m.	every	3 minutes
"	9:30 "	"	4:30 p. m.	"	4 "
"	4:30 p. m.	"	6:30 "	"	3 "
"	6:30 "	"	8:30 "	"	4 "
"	8.30 "	"	12:00 night	"	8 "
"	12:00 night	"	1:00 a. m.	"	15 "
"	1:00 a. m.	"	5:00 "	"	35 "
"	5:00 "	"	6:30 "	"	7 "

SUNDAY.

From	12:10 a. m.	to	12:55 a. m.	every	15 minutes
"	12:55 "	"	6:45 "	"	35 "
"	6:45 "	"	7:20 "	"	17 "
"	7:20 "	"	8:00 "	"	12 "
"	8:00 "	"	8:30 "	"	10 "
"	8:30 "	"	9:22 "	"	8 "
"	9:22 "	"	2:30 p. m.	"	7 "
"	2:30 p. m.	"	9:00 "	"	5 "
"	9:00 "	"	10:45 "	"	6 "
"	10:45 "	"	11:30 "	"	7 "
"	11:30 "	"	12:10 "	"	10 "

To run the present time-table 276 trains in 24 hours are required. With the three and four minute intervals, morning and evening, all trains have five cars, and during other parts of the day three-car and four-car trains are run.

The new power-house of the road will be under roof



Pittsburgh 10-Wheel Passenger Engine—Pittsburgh & Western Railway.

by Dec. 1. The electrical machinery is ready to be put in place as soon as the building is finished, and it is expected that early in 1898 the road will be running by electricity.

The Metropolitan Elevated has cut down its time around the Loop to 15 minutes, and is now running about 600 trains a day. It is understood that the percentage of increase in traffic on this road fully equals the gain shown by the South Side Elevated. The

Lake Street Elevated runs trains about three minutes apart morning and evening, and about six minutes in the middle of the day, so that the Loop is a pretty busy line. The financial reporters figure out an annual income for the Loop, at one-half cent a passenger, which, on the basis of the business thus far done, is sufficient to pay the interest on the bonds and 2½ per cent. on the stock of the Union Loop Company.

Poling Yard of Michigan Central Railroad at East Detroit.

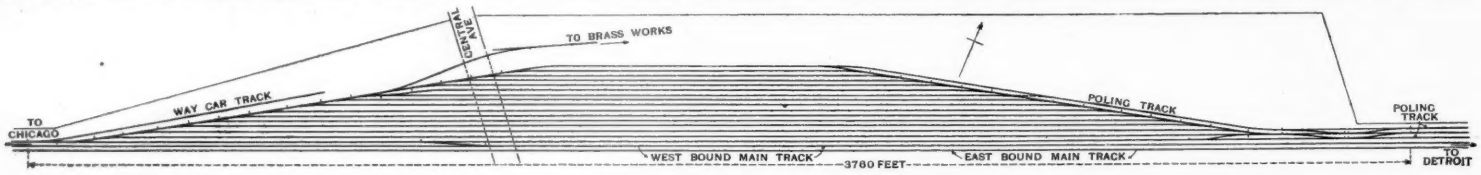
The Michigan Central Railroad has been working since Sept. 22, 1896, a poling yard at East Detroit, which is situated on the north side of the main tracks, opposite the roundhouse and repair shops. The arrangement of the tracks is shown by the accompanying engraving.

In this yard all westbound trains are switched and made up, but only part of the southbound trains, the Toledo Divison trains and the northbound trains on the Bay City Division are handled. On account of limited yard room it is impossible to make up all the Toledo and Bay City Division trains, and these are completed at other points. The yard serves the Canada Division, Bay City Division and Detroit yards directly and the Toledo Division indirectly.

Trains pull in on the three receiving tracks east of the distributing yard, each of which three tracks has a capacity of 90 cars. The engines are cut and go to the roundhouse, and a poling engine stakes the cars into the distributing yard. This yard is level and all poling is done toward the west. The way cars are placed on a gravity track at the west end of the distributing yard and way cars are let down on to the trains as they pull out.

Trains on the Michigan Central are handled on a tonnage basis, 1,190 tons being the maximum weight for eastbound trains and 1,640 tons for westbound trains. The number of cars in a train varies from 30 to 50, depending upon the proportion of loaded to empty cars.

The longest track in the distributing yards holds 70 cars and the shortest, being the outside track, 38 cars. In this yard only one engine can be used to advantage in staking cars and the crew usually consists of from five to eight car droppers, one staker and one yard conductor. When using one engine the capacity of the yard is about 1,400 cars per day.



Poling Yard at East Detroit—Michigan Central Railroad.

The Chief of the Coast Survey.

The appointment of a new Chief of the Coast and Geodetic Survey is a matter of great scientific and public interest. This noble institution has latterly been debased by politics, and if President McKinley is trying to clear it of that evil influence he is doing a work for which not only the nation but the civilized world ought to be grateful.

Whether or not the appointment of Prof. Henry S. Pritchett, now of Washington University, St. Louis, Mo., is an ideal one we are not in a position to say. There is no doubt that he is an able man. On that point we find agreement among the several men who know him well whom we have consulted. His really large and serious reputation is, however, yet to make. He is respected by those who know him; but the circle is limited and the work which he has done has been thoroughly scientific to be sure, but has not called for the breadth, strength and versatility of character which a man must command who is to successfully organize and control a work as great as that of the Coast Survey. On the other hand, there are men now on the Survey who have ample and proved qualifications for the place. In an ideal society one of these men would have been promoted.

Furthermore, we hear that there was an organized and well-conducted boom carried on in his interest, and it is melancholy that such a great scientific appointment should be sought for and worked for as if it were a post-office. But in these degenerate days the most dignified positions in the army and navy have been plotted for in the same way. One brigadier generalcy after another has been the object of a hunt which makes the old officers of the army blush for their service. So, perhaps, the impropriety, in fact the downright immorality, of applying the political office-getting methods to the pursuit of appointments of this nature was not appreciated by Professor Pritchett's friends.

Possibly we are wrong in supposing that such an organized boom did take place, and perhaps Professor Pritchett did not know about it. We are assured by those who ought to know, and probably do know, that "no man has ever had so nearly the unanimous support of the scientific men of the country as he has, whereas the political influences of this region (St. Louis) were all set in favor of another man." We are told that he was not a candidate in the ordinary sense and that his friends proposed him without his knowledge and that he never wrote directly to or filed papers with, any of the authorities at Washington. He had never been seen by Secretary Gage or by the President when his name was agreed upon, and he has been a lifelong Democrat, although he voted for McKinley.

Professor Pritchett is known among railroad men as the man who has had charge of, in fact who devised, the St. Louis (Washington University) time service distribution, which sent time daily all over the Western country. This he still does for the Wabash and some other roads, but now the service is generally given by the Western Union. He has had charge of the watch and clock regulation on the Wabash for many years.

Professor Pritchett was born at Fayette, Mo., in 1857, and was educated at Pritchett College, the home of his father. His father was a scholar, was interested in astronomy and was the director of an observatory. Mr. Pritchett became a student with Asaph Hall at the United States Naval Observatory, was later a computer at the Observatory, and later still Assistant Astronomer, where he was constantly associated with Hall. In 1880 he was appointed Astronomer at the Morrison Observatory, Glasgow, Mo., and he became Assistant Professor of Mathematics and Astronomy at Washington University, St. Louis, and in 1884 was made Professor of Mathematics and Astronomy at the same institution. This last position he held up to the time of his appointment.

He observed the eclipse of the sun in Colorado in 1878, and in 1882 he was sent as astronomer of the transit of Venus expedition to New Zealand. He made a series of pendulum observations in New Zealand, Australia, China and Japan for use in the determination of the earth's figure. He has been a contributor to various astronomical publications, and these articles have made him well known to astronomers. At Washington University he has done a good deal of work in co-operation with the observers on the United States Geological Survey and the Coast Survey, in longitude determination west of the Mississippi River.

Mr. Knapp on the Powers of the Interstate Commerce Commission.

Hon. Martin A. Knapp, member of the Interstate Commerce Commission, read a paper before the Board of Trade and Transportation of New York City last week on the question "How Shall Existing Laws for the Control of Interstate Carriers be Made More Efficient and Useful?" Starting out with the assumption that all are now agreed that freight rates must be public and must be the same to all persons, the speaker said that the two main questions are: (1) How to secure conformity to the standard rate and (2) how to alter the standard when it becomes unreasonable. The important distinction between injustice by rate cutting and injustice in rate making is frequently overlooked. Rate cutting is, or should be, a misdemeanor and it is not a proper or desirable function of the Interstate Commerce Commission to ferret out the numerous rate-cutting devices. The payment of rebates, underbilling, etc., must be discovered and punished the same as other offenses against the criminal law. It is true that the Commission is charged with the general duty of enforcing the Interstate Commerce law, but it has no special means of discovering offenders. At best it can only aid prosecuting officers in procuring evidence.

If Congress wishes to stop rate cutting it had better remove the motive for such wrong-doing, that is, legalize pooling. The supposed benefits of railroad competition are greatly exaggerated. "I do not see," said Mr. Knapp, "how anyone can derive benefit from competition in the matter of his daily wants, unless he is in a situation to choose freely between two or more persons who are each able to supply those wants. The objective value of competition rests in the power of selection, and he who is debarred from choice must be deprived of any direct advantage from the rivalry of others. As to most of our wants, broadly speaking, every person in every place has the opportunity to choose. And this liberty of selection is commonly enjoyed as to the ordinary needs of life, whether simple or complex. But in respect of railroad transportation only a few people comparatively are so situated as to have any available choice between carriers. To the great majority of people railway transportation is now a virtual monopoly. The result is that a few commercial centers and a few large shippers, having this power of choice, and finding their traffic indispensable to the carriers, secure great advantages of which the masses are deprived."

Railroad federation is radically different from the combinations known as trusts. In buying and selling merchandise we want free competition and do not want uniformity of price, but in railroad transportation uniform charges are a vital element. Indeed, we cannot have that free and fair competition in trade which is the condition of industrial freedom without methods and rates for public transportation which amount to a monopoly.

"Practically, therefore, the choice lies between competition on the one hand, with the inevitable outcome of discriminations which favor the few at the expense of the many, or like charges for like service, which can be realized only by allowing co-operative action by rival railroads. The power to compete is the power to discriminate. . . . The existing law presents this singular anomaly, that it seeks to enforce competition by prohibiting pooling, and at the same time to punish as criminal misdemeanors the very acts and inducements by which competition is ordinarily effected. For this reason the legal sanction of combination by rival carriers in the conveyance of passengers and property between competitive points is the one sensible and practicable plan adapted to present conditions and suited to existing requirements."

But the standard published rate may be strictly observed and yet injustice result. If pooling is permitted railroads will, many people believe, keep their tariffs so inflexible that the public will suffer. To guard against any serious impairment of commercial freedom in this way the state must exercise its authority to modify rates, when necessary for the public good. The power of the state to this end is undisputed. If a rate is complained of as too high and the charge is denied by the carriers complained of, how is the controversy to be decided? Are the carriers themselves to be the sole judges of the reasonableness of their rates? Are they to be the final arbiters of the just relation of rates between different commodities and different communities?

All existing tariffs have been made by the railroads themselves and as the great body of producers and consumers have little power to prevent inequality, except as they get the help of public authority, to investigate the rates and require their correction when found unfair is a government function of the highest utility. The obvious weakness of the law at present is the want of authority in the Interstate Commerce Commission to require the correction of unreasonable rates. This should be remedied and the Commission have the powers at least of a court of first instance. Mr. Knapp does not propose that the Commission shall establish schedules by legislative methods or exercise the power of fixing rates by *ex parte* orders. "Nothing of the sort is advised or desired. But it is proposed, when a given rate is complained of on the ground that it is excessive or relatively unjust, and that complaint has been examined upon due notice to the carrier and full opportunity to be heard, that the judgment of the Commission in such cases shall be binding upon both parties to the contention, unless judicial review of the proceedings before the Commission finds cause for preventing its enforcement. The exercise of such authority is the appropriate safeguard against the asserted dangers of legalized pooling."

Schenectady Twelve-Wheelers for the Butte, Anaconda & Pacific.

The Schenectady Locomotive Works has recently built three heavy 12-wheel compound locomotives for the Butte, Anaconda & Pacific Railway. These engines are now in service, working on heavy grades, and favorable reports are received of their performance. One of these engines weighs 193,000 lbs. in working order, 154,000 lbs. of which is on the drivers. The boiler has a total heating surface of 2,895.31 sq. ft., and carries a working pressure of 200 lbs. per square inch. The high pressure cylinder is 23 in., and the low pressure cylinder 34 in. in diameter by 32 in. stroke. The driving wheels are 56 in. in outside diameter. A general description follows:

TWELVE-WHEEL COMPOUND LOCOMOTIVE.

General Dimensions.

Gage	4 ft. 8½ in.
Fuel	Bituminous coal
Weight in working order	193,000 lbs.
" on drivers	154,000 lbs.
Wheel base, driving	15 ft. 9 in.
" " rigid	15 ft. 9 in.
" " total	26 ft. 9 in.

Cylinders.

Diameter of cylinders	H. P. 23 in., L. P. 34 in.
Stroke of piston	32 in.
Horizontal thickness of piston	4¾ in. and 5¾ in.
Diameter of piston rod	3¾ in.
Kind " " packing	Cast iron rings
" " " rod packing	Jerome metallic
Size of steam ports	H. P. 20 in. × 2½ in., L. P. 23 in. × 2½ in.
" " exhaust "	" 20 in. × 3 in., " 23 in. × 3 in.
" " bridges "	1⅝ in.

Valves.

Kind of slide valves	Allen-American
Greatest travel of slide valves	6¼ in.
Outside lap " "	H. P. 1¼ in. L. P. 1¼ in.
Inside clearance " "	¼ in.
Kind of valve stem packing	Jerome metallic

Wheels, etc.

Diam. of driving wheels outside of tire	56 in.
Mat'l " " centers	American cast steel
Tire held by	Shrinkage
Driving box material	Cast steel
Diam. and length of driving journals	Main 9 in. dia. × 10 in. Intermediate F. and B. 8½ in. dia. × 10. in.
" " " " main crank pin journals	Main 6½ in. × 6 in., main side 7 in. × 5½ in.; inter. 5½ in. dia. × 5 in.
Diam. and length of side rod crank pin journals	F. and B. 5 in. dia. × 3¾ in.
Engine truck, kind	4-wheel, swing bolster
" " journals	6 in. dia. × 11 in.
Diam. of engine truck wheels	28 in.
Kind " " "	Schenectady Locomotives Works, steel tired, cast-iron spoke center

Boiler.

Style	Extended wagon top

Outside diam. of first ring	72 in.
Working pressure	200 lbs.
Material of barrel and outside of firebox	Carbon steel
Thickness of plates in barrel and outside of firebox,	$\frac{11}{16}$ in., $\frac{13}{16}$ in., $\frac{3}{4}$ in., $\frac{5}{8}$ in. and $\frac{9}{16}$ in.
Horizontal seams	Butt joint, sextuple riveted, with welt strip inside and outside
Circumferential seams	Double riveted
Firebox, length	120 in.
" width	42 in.
" depth	Front, 77 in.; back, 73½ in.
" material	Carbon steel
" plates, thickness	Sides, $\frac{5}{16}$ in.; back, $\frac{5}{16}$ in.; crown, $\frac{3}{8}$ in.; tube sheet, ½ in.
" water space	Front, 4½ in.; sides, 3½ in. to 4 in. above grates; back, 3½ in. to 4½ in. at crown
" crown staying	Radial stays, 1⅛ in. diam.
" stay bolts	Ulster special, 1 in. diam.
Tubes, material	Charcoal Iron No. 12, W. G.
" number of	328
" diameter	2¼ in.
" length over tube sheets	14 ft.
Firebrick, supported on	Studs
Heating surface, tubes	2,688.8 sq ft.
" " firebox	206.51 sq. ft.
" " total	2,895.31 sq. ft.
Grate "	35 sq. ft.
" style	Rocking
Ashpan, style	Sectional, with dampers front and back. "Swipe" to clean ashpan, R. R. Co.'s style
Exhaust pipes	Single
Exhaust nozzles	5¼ in., 5½ in. and 5¾ in. diameter
Smokestack, inside diameter	18½ in. at top, 16 in. near bottom
Smokestack, top above rail	14 ft, 11 in.
Boiler supplied by	Two injectors, Ohio, Standard "A," lever movement

Tender.

Weight, empty	38,150 lbs.
Wheels, number of	8
" diameter	33 in.
Journals, diameter and length	4½ in. diameter × 8 in.
Wheel base	14 ft. 7 in.
Tender frame	10-in. steel channels
" trucks	Channel iron, center bearing, F. and B., with additional side bearings on back truck
Water capacity	4,500 U. S. gallons
Coal "	9½ (2,000 lbs.) tons
Total wheel base of engine and tender	53 ft. 7 in.
" length " " " "	62 ft. 5 in.

Engine provided with:

Three 3-in. Crosby safety valves, one muffled and two adjustable pops.

One McIntosh blow-off cock.

American brake on all drivers, operated by air. Westinghouse automatic air-brake on tender and for train, Westinghouse 9½ in. air pump.

Two sand boxes, with Leach sand-feeding apparatus on each box.

Tender brakebeams, Kewanee reversible, outside hung.

Headlight, Star, 16-in. round case.

Water brake, Le Chateliers, on cylinders.

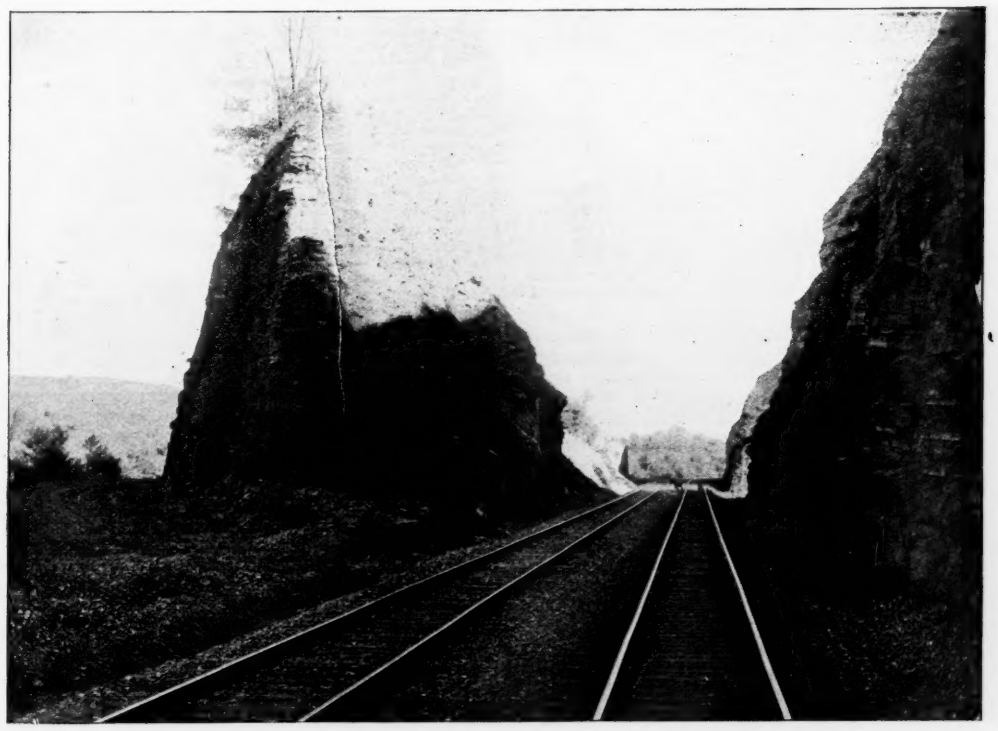
Chafing iron, spring buffer between engine and tender.

Lagging, asbestos cement on boilers, magnesia sectional on cylinders.

Combined Rack Rail and Adhesion Locomotives.

About 36 miles directly inland from the port of Emmahaven, on the west coast of the island of Sumatra, are some rich coalfields, which are reached from the coast by a railroad 97 miles long, with several grades of from five to seven per cent. This railroad has a branch 10 miles long, with maximum grades of eight per cent.

Of the total 107 miles of this road, which forms a part of the Sumatra State Railroads, 19 miles is rack railroad. This is built on the Riggenbach principle, the rack rail consisting of two steel channel bars joined together transversely by pins riveted in the webs, thus forming a rack between the backs of the bars. This rack rail is bolted to cast-iron supports, which in turn are bolted to the steel sleepers. This railroad, which has a gage of 3 ft. 6 in., and the locomotives used on it, have recently been described in *Engineering*, of London.



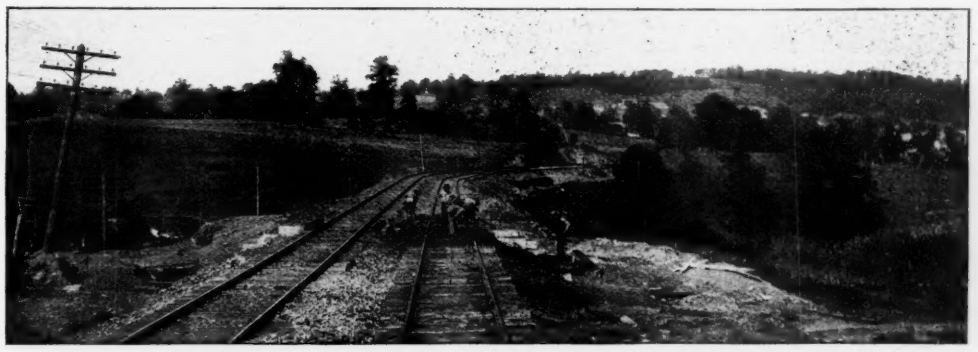
Baltimore & Ohio Improvements—View of New Track at Seven Curves.

These locomotives are of two types, in both of which the Riggenbach principle, by which the engines can be worked either by adhesion or rack rail, has been employed. They each have only one set of cylinders and moving parts, the gear wheels always moving whether the locomotive is working as a rack-rail engine or not.

The engines of one of these types are carried on two pairs of driving wheels and a pair of trailers. They have outside cylinders, and the connecting rods are coupled to crank pins fixed in small flywheels at the ends of the transmission shaft. This shaft is carried somewhat in front of and above the rear pair of drivers. It carries a pair of pinions that grip into a corresponding pair of tooth wheels, which are bolted to the sides of the main spurwheel. The main spurwheel shaft is placed about midway between the two pairs of drivers but a little above the plane of their axles. The journals of the transmission shaft and the main spurwheel shaft are both rigidly fastened to the frame plates, so that with every rise and fall of the engine on its springs the diameter of the pitch circle of the main spurwheel is made to vary. This, however, has been found to give no trouble, since practice has proved that this up-and-down motion does not interfere with the working of the engines. The main spurwheel bearings being fixed, the hornblocks, between which the driving-wheel journal boxes move up and down, are placed perpendicular to the lines passing through the centers of the driving wheels and the spurwheel center. The object of this is to keep the distances between crank-pin centers, that is, the length of the connecting rods, as nearly constant as possible for every oscillation of the engine.

Each engine is arranged for four different ways of braking. These are by means of the ordinary brakeshoes which are applied to the front pair of drivers; by a brake applied to the crank-pin flywheels, which consists of a steel band lined with wooden blocks which fit into a series of grooves in the face of the flywheel; by a similar brake working on two wheels between which is bolted a spurwheel, the whole turning loosely on the forward driving axle. When the band is tightened, the grooved wheels with the spurwheel tend to stop turning and so stop the engine. This brake, which is used only in case of an emergency, can be worked either by hand or steam power. The first two brakes are worked by hand only. The fourth way of stopping is by reversing the valve motion without admitting steam and cushioning by air, which is drawn into the cylinders through a special valve placed in the exhaust pipe. This is the ordinary way of braking the engine.

The other type of engines used on this railroad is carried on two pairs of driving wheels. About midway between these and somewhat above the level of their axles the main spurwheel shaft is fixed. The power from the pistons is not transmitted to the main spurwheel by means of an intermediate shaft, but is applied directly from the crank pins of the rear drivers by means of coupling rods connected to crank-pin flywheels on the ends of the main spurwheel shaft. From here, other coupling rods connect with the front drivers, which with the rear ones carry the whole weight of the engine, and so enable the locomotive to work as a combined adhesion or rack-rail engine. The cylinders, valve chests and valve motion are placed outside the frames. The main spurwheel shaft is placed in bearings rigidly attached to the frame plates the same as in the other type of engines, and no trouble has been experienced from the up-and-down motion consequent upon this arrangement. The



Baltimore & Ohio Improvements—East End of Myers' Hole, Looking West.

cheeks of the guides for the driving-wheel journal boxes are placed perpendicularly on the lines through the centers of the spurwheel and driving wheels in order to keep the length of the connecting rods nearly constant, the same as in the other type of engines.

This class of locomotives is equipped with the ordinary brakeshoes on the rear drivers, and a powerful brake acting on the crank-pin flywheels, the same as described for the other type of engines. Both of these brakes can be worked either by steam or by hand. These engines can also be stopped by reversing the valve gear in the same way as referred to in the other class. These locomotives are intended to run trains at a speed of 15½ miles an hour, which is higher than the transmission type can attain.

Both classes of locomotives are of the tank type. The gage glasses are placed in about the middle of the boiler, with the view to show the mean water level when the engine is on the incline. A noticeable point is the difference in diameter between the pitch circle of the main spurwheel and the coupled drivers. This amounts to ⅜ in. when the tires are new. The object is to allow for wear of the tires, and it may be said that no trouble has been experienced from this difference.

Improvements on the Baltimore & Ohio.

(*Continued from page* 719.)

Among the improvements which the Baltimore & Ohio has been making along its lines during the past two years, we find an extensive replacing of 67-lb. rails by a heavier section (85 lbs.), the rebuilding or strengthening of many bridges to bring them up to the standard demanded by higher speeds and heavier engines, and several important changes in alignment and grade. Among the latter the most important pieces of work are those at Myers Hole, Falls Cut and Seven Curves.

The work at Myers Hole consists of two reductions in grade, the filling up of a long dip, and a change in alignment to reduce the curvature. The work begins a short distance south of Tabb's station, W. Va., between Cumberland and Harper's Ferry. The new grade cuts about 11 ft. from the top of the summit, reducing the grade from the point of beginning the change from a rise of 42 ft. to the mile to a gentle descent of −0.2 per cent. Accompanying this change in grade there is a change in alignment, a tangent with light connecting curves being substituted for the existing reverse curve. Passing Tabb's station, the next change is at Tabler's Summit, where an almost indentical change in grade is being effected. Here 13 ft. of the summit has been cut away, reducing the grade successively to −0.05 per cent., −0.02 per cent. and −0.1 per cent. Here also the location is changed, the line being thrown in on the summit, and out on the descent, reducing the curvature materially and putting in a long tangent.

Passing Tabler's Summit we come to Myers Hole proper, which has been filled up to a depth, at the deepest point, of about 12 ft. This fill is nearly a mile long. It does not entirely remove the sag in the line, but the grade is only −0.2 per cent. At Myers Hole the greatest change in alignment occurs, two long tangents and a 4 deg. and 3 deg. curve being substituted for a heavy double reverse curve. The reducing of the grade here has been difficult owing to the proximity of the old line, and the necessity for constantly running trains over it. At one point, where the old and new lines cross near Tabb's station, the old line had to be carried over the new by means of a temporary trestle. In some places the new cut is so near the old track that the cutting is perpendicular and within 2 ft. or less of the ends of the ties in the old track. This is particularly the case near Tabler's Summit, where the cut has been largely through rock. Great difficulty has been found in taking out this rock, owing to the danger of blasting so near the present tracks.

West of Tabler's Summit the change in line necessitates a cut about 25 ft. deep through a small hill. The material taken from this cut is used in filling in Myers Hole. Just before reaching North Mountain station the

line crosses a country road on a plate girder bridge of about 20-ft. span. This bridge is in place.

The work at Seven Curves, a description of which appeared in the *Railroad Gazette* for Dec. 25, 1896, was completed and put in use about July 1. It is a noteworthy improvement, and the tangents which replace the old series of reverse curves are very welcome to passengers.

FALLS CUT.

The work at Falls Cut consists of a change of line to avoid a dangerous cut through shifting and treacherous rock. To do this it was necessary to build three double-track bridges and a double-track tunnel 530 ft. long. The engraving, Fig. 1, shows the old and new alignment. Falls Cut is about 22 miles west of Cumberland, Md. It has long been a source of trouble, constant precautions having to be taken to keep the loose rock on the sides of the cut from sliding down upon the track. As now operated, the sides of the cut are shored up by heavy timbering, and so close is this timber work that the cut is nearly as dark as a tunnel. There is, of course, constant danger of fire from sparks igniting these timbers, rendering a constant watch necessary.

As the engraving shows, the new line of the road approaching the cut at *A* from the direction of Pittsburgh follows pretty closely the old alignment, with the exception that about 800 ft. of tangent replaces a double reverse curve. Near the entrance to Falls Cut the new line strikes off to the southeast, avoiding the cut through the spur of the hill by running along its base considerably nearer the shore of Wills Creek. Crossing this creek on a double-track latticed bridge of 60-ft. span, we reach the entrance of the tunnel at *B*. The tunnel is 30 ft. wide and 530 ft. long. About 20,000 cu. yds. of material, mostly rock, will be taken out in making this tunnel, and some 3,000 cu. yds. of masonry is required for the bridge abutments. On leaving the tunnel the line crosses Wills Creek for the third time, and here there is a bridge of 80-ft. span. The entire work is on a down grade, running toward Cumberland. The tunnel itself is now complete and the bridges are erected, the grading is well under way and the temporary track is laid up to the bridge.

The Pittsburgh & Connellsville Railroad, which is that part of the Baltimore & Ohio from Cumberland to Pittsburg, is single track for 100 miles, but plans have been made to double track it, and all new work being done is for two tracks. In many places the second track is now being laid. Near Myersdale, west of Falls Cut, long stretches of ballast and new ties are to be seen. The line is now double track out of Pittsburgh as far as Connellsville, 58 miles.

[TO BE CONTINUED.]

Application of the Storage Battery to Electric Traction.*

BY CHARLES HEWITT.†

The most important applications of the storage battery to electric traction are:

I. The application of the battery direct to car or locomotive. 2. The application of the battery at points on the line distant from the generating station. 3. The application of the battery in the power house.

The Application of the Battery Direct to Car or Locomotive.—In a paper before the Engineers' Club of Philadelphia, Dec. 5, 1896, I gave in detail results of a test made by me of a certain battery car. The main results agreed quite closely with data which have come to us through European publications, and I feel confident in stating that the battery car requires considerably more power to operate than an ordinary trolley car of the same size and under the same conditions, and, further, the battery car will require a larger investment in generating machinery. The unreliability of the battery car and the disadvantages due to the necessity of constantly changing the batteries are familiar to you all, and we have no facts which would warrant us in holding out any hope of improvement in this line. In fact, unless some form of battery be discovered with entirely different characteristics from the lead battery, I should advise leaving such experiments to those who enjoy spending money on this kind of a hobby. When the action of the battery is thoroughly understood it is not difficult to understand the cause of failure. Every battery has what may be termed a critical rate of discharge. From zero up to the critical rate the electromotive force remains practically constant. Above the critical rate the electromotive force decreases as the rate of discharge increases; on the other hand, it increases with the rate of charge and the length of charge. For any particular battery there is a rate of charge which cannot be exceeded without useless waste of energy. With a fairly constant discharge at the average rate used by the car, with rests of one minute every 15 minutes, the fall of electromotive force is very marked. You will appreciate, therefore, the remarks of Sir David Salomon, "that it takes power to get current through the battery, and it also takes power to get the current out." These critical rates of charge and discharge seem to be partly due to the time required for the chemical reactions in the battery to take place. The physical limitations of a car require the battery to have a large output for its weight and bulk. To obtain this it is necessary to increase the surface of active material as much as possible and to decrease the inactive supporting grid. In consequence the battery plates become mechanically weak. The conditions seem to prevent the making of plates large enough to prevent exceeding the critical discharge rate, and which are at the same time light enough and small enough to be carried on a car. The inherent characteristics of the lead battery are such that it is very doubtful whether it will ever be successful in propelling cars unaided by other sources of power. Great results are expected from the experiments now being made in Chicago, but great results have been expected before, and I do not look for results in Chicago much different from those that have preceded. It is claimed that the batteries in use in Chicago will show a much longer life than any that have as yet been tried. But even if the life of the plate were all that could be desired, we would not feel warranted in recommending the system.

There is another phase of this method of application which is used somewhat extensively in Europe. In some of the larger cities on the Continent there is a prescribed area within which overhead lines are not allowed to be erected. To overcome this difficulty the cars are supplied with batteries sufficiently large to propel them at a low rate of speed for a distance of three or four miles from the point where the overhead line ends into the city and return. While the cars are completing the trip the batteries are charged from the overhead wire. I am sure such an arrangement would not commend itself to any practical railroad manager, except as a makeshift in such government ridden cities as exist in Europe.

The following data are taken from the writings of Mr. Dawson and others:

Data of Accumulator Cars Running in Paris.

Number of cells	108
Number of plates per cell	11
Size of plates, in inches	7⅞ × 7⅞
Thickness of negative plate, in inches	.236
Thickness of positive plate, in inches	.315
Weight of plates, in pounds	39.69
Capacity in ampere hours	250
Efficiency, per cent.	70
Average discharge rate	85
Maximum discharge rate	100-200
Life of negative plate in car miles	93,750
Life of positive plate in car miles	8,750
Passengers carried	50
Weight of loaded car, in pounds	30,870
Weight of cells, in pounds	6,615

Working Expenses in Paris in 1893, Per Car Mile.

	Cents.
General expenses	.408
Cost of power	5.656
Maintenance and handling of accumulator	5.074
Motormen and assistants	2.420
Maintenance of motors and trucks	2.820
Heating, lighting and various	.276
Total	16,654
Miles run	144,718

OPERATION.

Comparative Cost of Various Systems of Traction in Paris in Cents, Per Car Mile.

	Cents.
Horses	17.10
Accumulator	16.66
Hot water locomotives	10.78
Overhead trolleys	9.24

A third phase of the battery car system is the battery locomotive. The one most worthy of mention is the experiment on the Thirty-fourth street branch of the Sixth avenue elevated in New York, in which the battery is connected in multiple with the motors and charges or discharges according to the demands of the train. When the demand of the motors is sufficient to lower the pressure on the line to or below that of the battery, the battery will then discharge into the motors, thus relieving the feeders. When current is shut off from the motors, the battery will charge. No results of this experiment have been made public yet, but it is difficult to see how much is to be expected. It has the advantage of maintaining a fairly constant pressure at the motors, but this can be accomplished better in other ways. It subjects the battery to usage which history has proved to be disastrous to its life and efficiency. In this method the extra weight of the battery has the certain advantage of giving additional adhesion to the rails.

The Application of Storage Batteries on the Ends of Long Lines.

The battery in this case acts essentially as a pressure regulator. The conditions do not restrict the size of the plates, so that the plates can admit of such a size that the current density on discharge can be kept well within the limits of normal discharge; and in consequence of this, the battery is not subject to the great loss of efficiency, due to the fall of electromotive force on discharge. Only a few such installations have been made, two of which are on the Isle of Man; one has been installed by the Anaconda Mining Company at Butte, Mo.; there is also a small plant at Merrill, Wis. The first installation, however, that has been made for any large city road for its suburban service, I find, is the one installed by the Union Traction Company, of Philadelphia, Pa. The road was originally a horse car line which ran as far as the depot at Pelham, a distance of 7.2 miles from the power-house. Conduits and conductor cables were installed for operating a number of cars which were supposed to be amply sufficient. The phenomenal increase in the travel, however, necessitated a large increase in the car service. In addition, the success of the line warranted its extension to Chestnut Hill, 2.3 miles further. More recently the line has been extended down a long grade to Hillcrest avenue, and from Hillcrest avenue to the Wheel Pump on the Bethlehem Pike, 1.6 miles further, making the line 11.2 miles from the power house. With the first extension of the line to Chestnut Hill, the underground cable was also extended, but the drop in pressure over this long line made it impossible to run the requisite number of cars. It was necessary, therefore, to furnish some means of keeping up the pressure. If a station had been built at that point, it would of necessity have been small and inefficient. From records taken at the main power house it was found that it would be necessary to provide a station of about 750 KW. capacity; such a station would have cost about $85 per horse power, or a total of $85,000. A battery station, on the other hand, required but little real estate, the entire cost being approximately $25,000; to this must be added the cost of a booster in the main power house, which, with its engines, was about $8,000. In addition to this, the batteries were put to an expense of a little over $13,000 for changes in the cable. It is very apparent, from the facts given, that on the score of the first cost, the battery was by far the cheapest installment which they could make.

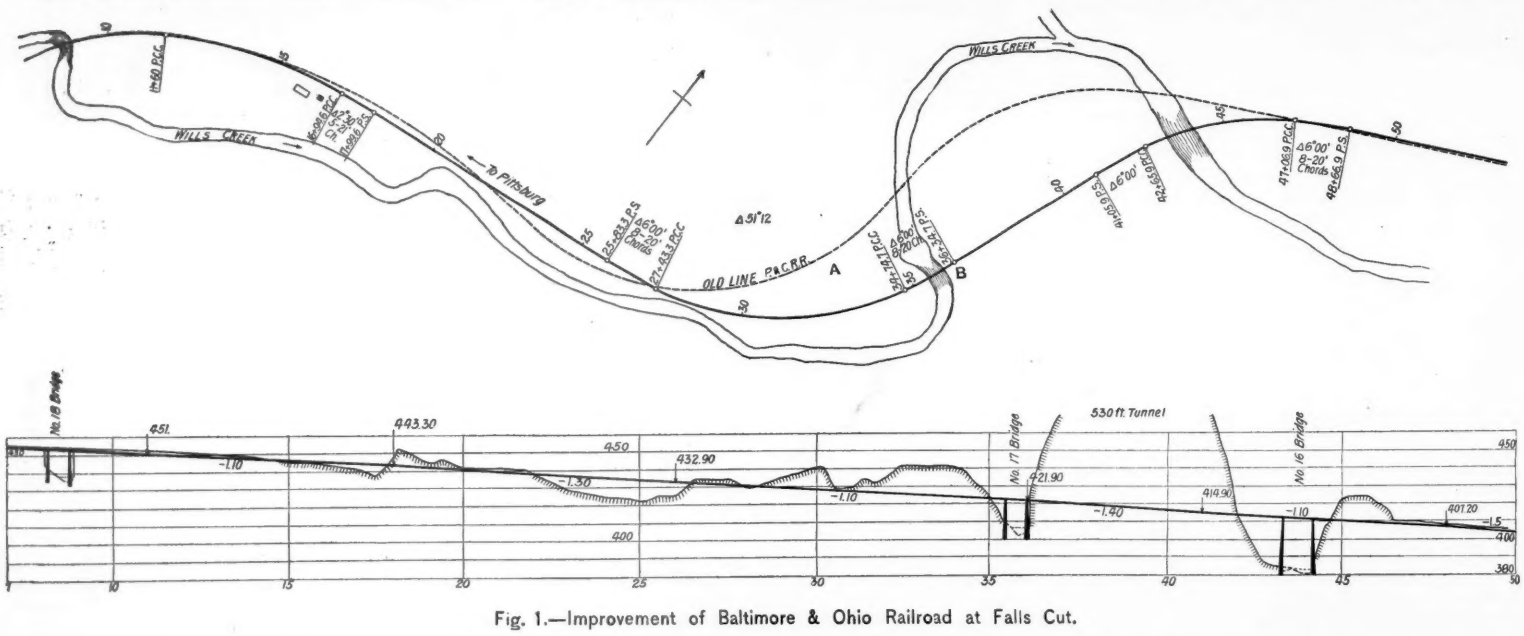
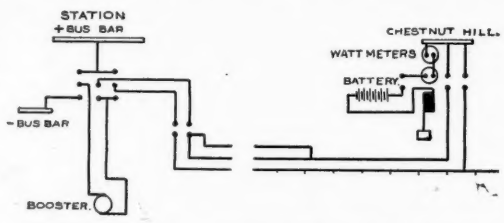


Fig. 1.—Improvement of Baltimore & Ohio Railroad at Falls Cut.



Storage Battery Connections on Chestnut Hill Branch, Union Traction Co., Philadelphia.

You will see by the accompanying diagram that there are three cables concerned in this work, which are all of 1,000,000 cm. capacity; the lengths of these cables are shown on the diagram, and only one supplies the trolley wire direct. This cable runs all the way from the bus bar at the power-house to the end of the line on the Reading Pike at Chestnut Hill. The other cables run direct from the power-house to the bus bar at the battery house, as shown in the diagram. In ordinary operation the current on these cables passes through the booster at the power-house, by which the initial pressure is raised 150 volts more or less above the ordinary bus-bar pressure of 550 volts. By this means the drop in the cable is overcome, so that the pressure at the battery house can be adjusted to a point where the battery varies but little to either side of the zero point, or in other words, it charges and discharges continualy, maintaining the load on the cables nearly constant, and consequently maintaining a constant electromotive force where the current passes out from the battery house. The line is therefore fed from two points, namely, from the power-house end at

*Extracts from a paper, with discussion, at the Niagara Falls meeting of the American Street Railway Association, Oct. 19-21, 1897.

†Electrical Engineer, Union Traction Co., Philadelphia.

550 volts, and from the Chestnut Hill end at about 515 volts. As a consequence the distribution along the line from Wayne Junction to the end at Chestnut Hill is comparatively uniform and is now very satisfactory.

At first the battery was allowed to discharge during the day about three times as much as it charged, making up the charge at night between the hours of 1 a. m. to 5 a. m. Later, the amount of day discharge was decreased until the charge and discharge were about equal. The first gave a very even voltage of a little over 500. With the present method the voltage is somewhat more irregular, but the average is somewhat higher. By keeping the battery continually up to full charge, the night man has been dispensed with.

Cost of Operating.—From volt and ampere meter readings taken from the power house in October, 1896, we find that 136,576,919 watt hours were delivered to the line at the battery house. These figures, I may explain, do not include the watt hours generated by the booster, since we have assumed that this entire amount is lost in transmission. As a matter of fact, this is not strictly correct; but if a station were operated at Chestnut Hill, it would be run at a bus bar pressure a little above the battery pressure, and therefore for our present purposes the assumption is correct. From our experience in operating power houses of various capacities, we find that a power house operated at Chestnut Hill under conditions which I have described would cost about 1½ cents per kilowatt hour. We find that the cost of generating the number of kilowatt hours required by the Chestnut Hill branch during the month of October, 1896, if furnished by a station at Chestnut Hill, would be $2,931. The actual cost of operating the battery and booster for the same month, exclusive of interest and depreciation, was 7 mills per kilowatt hour, or a total of $1,375. Including the depreciation of battery at 5 per cent. per annum, interest at 5 per cent. per annum on $33,000, and taxes, insurance, etc., the total cost of operation for October, 1896, was $1,628.24. We find, therefore, the difference in favor of the battery for the month to be $1,302.83. Since Oct. 1, 1896, the method of operating has been somewhat changed, and by installing watt meters more accurate data have been obtained.

Cost of operating power house for May, 1897, was .6 mill per kilowatt hour. Five per cent. depreciation of battery is amount guaranteed by makers. Deducting $1,100.76, the actual cost of operating battery for May, 1897, from $2,454.14, the cost if station had been built at Chestnut Hill, we find a saving of $1,353.38 in favor of the battery. We may safely say, therefore, that the saving by using the battery is about $1,350 per month or about $16,200 a year.

At the end of 15 months of continuous operations, we have only had to repair two leaky tanks at an expense of about $25. The positive plates look as good as when first installed, and show no depreciation whatever; the negatives, on the other hand, have contracted somewhat and some of the plugs have cracked, but this in no way impairs their usefulness.

This method of power distribution cannot always be considered economical, but where the conditions are such as we have described, there is no question as to the economy in favor of the battery.

Application of Battery to Power House.—The wide fluctuations in load in railroad power houses are now well known. The average daily load varies from 50 per cent. of the maximum in small stations to 70 per cent. of the maximum in the largest stations. From a very large number of observations in all parts of the country, I find that in the majority of stations the average load is very close to two-thirds of the maximum load. Now, it is also a well-known fact that the maximum economy of the steam engine exists for a very small range of load, and that on each side of the point of maximum economy the efficiency falls off; rapidly on the overload, somewhat less rapidly on the underload. The result is apparent. In most stations the engines, at the best, have an average load of only two-thirds their most efficient load, and as a consequence consume over 4.5 lbs. of coal per KW. hour. With badly regulated engines, and especially with water power plants, the changes in load are accompanied by variations in speed and consequently in voltage. These troubles may be entirely corrected by installing a battery.

The battery in this case becomes distinctly a load regulator. In Easton, Pa., the battery is quite small and the advantage is not quite so marked as it would be if a larger battery were used. Instead of using four generators, however, they are able now to operate the same number of cars with three engines. It is necessary that the capacity of the battery should bear a larger ratio to the output of the station than is necessary for potential regulation as described in the previous section of this paper. In potential regulation a comparatively small battery is necessary, since by changing the potential of booster from time to time during the day the charge and discharge can be kept very low. In the case described a battery rated at 120 amperes has successfully regulated for a total output of 1,400 amperes. For load regulation, however, the battery should have a capacity equal to one-third the maximum output of the station. The average load of the station may then be made the maximum load of the engines, the battery taking care of the fluctuations. As in the previous case, there are no physical limitations to be placed on the size of the plates to be used, and the charge and discharge may be kept well within the normal rates. Under such conditions the efficiency of the battery is high—85 to 90 per cent.—and the deterioration very low.

DISCUSSION.

MR. JOHN MACFAYDEN, Chester, Pa.: Do you recommend the storage battery in conjunction with the booster in stations of a capacity, say, of 900 amperes?

MR. HEWITT: From my observation I believe that all small stations could be worked with greater economy if they had a storage battery; of course the question of investment must be considered in all these cases.

MR. MACFAYDEN: What is the difference in cost between the KW. output of the booster, independent of the battery?

MR. HEWITT: The only case in which I have had personal experience is the one in Philadelphia. I assume the output of the booster to be the same as the general output of the station. We do not keep separate records of the cost of it, and it would be impossible to do so. The steam furnished for the battery engines is from the same source as the steam furnished for the other engines, and we could not separate them; but I have taken the cost of the station for the months described, and assumed that was the pro rata cost of the KW. hour generated by the booster.

MR. W. S. PATTERSON, Salt Lake City, Utah: In Salt Lake City we have a steam plant as well as a water power plant, and we are now running our system by water power 18 miles from the city. We have occasionally been compelled to shut down, but we still have our steam plant kept in good running order. In this it takes from an hour to an hour and a half to steam up when these things occur. I was thinking when listening to the paper being read that it might be possible that we could operate a storage battery in connection with our plants. I would like to ask Mr. Hewitt if, in his opinion, we could run the plant by a battery, and if so, at which end of the plant would it be best to put the battery?

MR. HEWITT: I think that I am right in saying that the transmission referred to by the gentleman is an alternating current transmission, and there are difficulties in working a storage battery in conjunction with an alternating current. For that reason it would be impracticable to put the battery generating end at the steam plant end, which, I presume, in the city, is simply a question of dollars and cents. A battery can be bought large enough to run any road in the United States, if you want to pay for it. In using the battery, in conjunction with other sources of power, you take up simply the fluctuations, and let the station do the main work; but to have a battery installation large enough to do the entire work, and to make the fluctuations as well, you would find it necessary to have a pretty large battery for any ordinary road.

MR. MACFAYDEN: Would you consider it economical to have a booster and storage battery combined, as a booster line, where you would only want the power at certain times, during heavy loads and on heavy grades? The reason I ask is that we have a booster and only use it as required, and we have very good results, using it without any storage battery at all. Would it be better to have the battery in conjunction with the booster, for such work, or turn the generator into a booster? We can use it either way, as required. If we do not use it as a booster, we can run it as a generator.

MR. HEWITT: In the case referred to at Chester, I do not think the battery would add to the economy. The battery, as a potential regulator on the end of a long line, becomes useful when the variations are so great that in case of a sudden stopping of the cars the potential would go so high as to do damage. For instance, at Chestnut Hill, on our plant there, we at times have the booster as high as 250 volts, above the usual 550 volts, making 800 volts in all. If the cars should be stopped or blocked at any point, the potential would go very high, and become dangerous and blow out the lights in the lamps and cause damage to controllers and other consequences would be sure to follow. The battery prevents the pressure going up in such cases. In the case the gentleman has spoken of, where the potential does not have to be boosted so high as to be dangerous, and is only boosted at times of heavy load, when the potential on the end of the line is within safe limits, I do not think it would be economical to use a battery.

Mr. C. P. WILSON, Sioux City, Ia.: During the last few years a number of the smaller plants throughout the country, those which are operating a load from 300 to 1,000 amperes, have installed direct connected units, a great many of them using compound engines. As Mr. Hewitt stated, these engines run at their highest efficiency only through a small range of the load. In these smaller plants, these engines run at very light load most of the time. As Mr. Hewitt spoke briefly of the application of storage batteries to stations for load regulation, I would ask him if he can say anything further on that point, and give some idea of what saving could be effected in stations of the size I have mentioned.

MR. HEWITT: I spoke briefly on that subject because there has been so little done in that line. If I had gone any further, it would have been in the line of argument only, and I wanted to keep as close to the facts as possible. In the case at Easton, it required four engines to run their cars. At the present time they run with three engines. That of itself shows that these three engines will run more economically than the four in the previous case, the number of cars remaining the same. The difference will be between the economy of an engine running at approximately its maximum economy and an engine running at a low economy.

MR. ELY, Niagara, Falls, N. Y.: I agree with Mr. Littell that this is probably the most important question coming before us, as it means, if successful, the saving of thousands of dollars. We are taking power for the Buffalo & Niagara Falls Railway, and the other street railroads of Buffalo as well, from those large generating companies, the Niagara Falls Power Co. and the Niagara Falls Hydraulic Power & Manufacturing Co. They generate the power and sell it to the street railroad companies at so much per electrical horse power per annum. You will see at a glance that the street railroad company has to pay for that power whether it is used or not, and for eight hours of the day, on an average, but a small quantity of the power will be used, and for a certain number of hours, on our line particularly, for four or five hours, no power whatever is being used; but we are paying all the time the fixed ratio for the entire amount of power. If the accumulator could be used to store the current, and we could use it at times when we might not take it from the power companies direct, it would be a saving to our companies of thousands of dollars per annum. In Mr. Littell's case it would be a great saving. His company is taking $1,000 H. P. daily per annum from this transmission line, and they are going to take more. Mr. Hewitt, in your judgment, as the result of your investigation, has the state of the art advanced to that degree that storage batteries or accumulators may now be safely, practicably and economically installed to meet such cases?

MR. HEWITT: Yes, sir, I think the batteries can undoubtedly be installed in such cases with economy. It is merely a question of size. The trouble in most cases has been an over-rating of the batteries. The batteries are expensive, and in most cases the railroad companies have been afraid to buy a battery large enough to do the work well. If you buy a battery which is too small, it will go to pieces. If you pay enough money to get one that will last you for years, it will do the work well, and will be a valuable auxiliary. Whether it will be a saving to any considerable extent in this particular case, I could not say, off-hand.

Street Railroad Improvements in Baltimore.

The Baltimore & Northern Electric Railroad Company opened a part of its line for traffic on Monday, Oct. 18. Six and one-half miles of passenger service between Baltimore and Mt. Washington has been completed, and cars are now running regularly on a 12 minute schedule.

The new line extends from the corner of Lafayette avenue and Charles street, where it joins the tracks of the City Passenger Railway Company, to the Falls Road turnpike, following that thoroughfare nearly the entire distance to Mt. Washington. In passing under Cedar avenue bridge it became necessary to lower the turnpike grade 6 ft., and a few other cuts were made through Woodberry and Hampden to level the hills and reduce the heavy grades.

Along the edge of Western Run, as the turnpike rounds the bluff beyond Hampden, a retaining wall 350 ft. long was built and the roadbed was widened 10 ft. As the line approaches Mt. Washington it becomes necessary to cross the Falls, and the tracks of the Northern Central Railroad. This is done by means of an elevated structure 1,475 ft. in length, built of steel supported on stone abutments. The tracks are laid with steel rails ballasted by crushed stone, and are capable of carrying heavy cars at a high rate of speed.

The line to Mt. Washington branches on Kelly avenue above the turn, one line running over to Pimlico and West Arlington about three miles long. Another branch goes to Pikesville, where it will serve as a connection with the Pikesville & Emory Railroad. The route thus formed, when completed, will be 21 miles long from the terminus in Baltimore to the camp grounds, and it will establish almost an air line between these points.

Through a traffic arrangement with the City Passenger Railway Company the cars of the Baltimore & Northern run into the city over the Blue Line to the corner of Baltimore and Calvert streets. Besides, transfer privileges are allowed to all the lines of the C. P. R. Company, which virtually gives the new road access to all parts of Baltimore. The fare to the city limits is 5 cents, and 10 cents to Mt. Washington. It is intended to charge extra fares to Arlington and Pikesville, and the cost of trip will be about 1½ cents a mile.

Power is obtained for operating the line to Mt. Washington from the power-house of the Belt Line Railway, and a contract has been signed, by the terms of which sufficient motive power is to be provided from this source to supply what is lacking at the lower end of the line. The power-house of the Pikesville & Emory Grove Railroad, at Owings Mills, will be utilized to its fullest extent, but it is expected that the branches to Mt. Washington and Arlington will be propelled from the plant below Camden Station.

The Baltimore & Northern Electric Railroad Company was chartered by the Maryland Legislature two years ago, being authorized to issue capital stock to the amount of $1,000,000, and it has sold $1,100,000 worth of bonds with which to build and equip the road.

Changes incident to the consolidation of the lines of the City & Suburban and of the Traction companies have now been worked out. They have resulted in a considerable lengthening of routes and a lessening of the number of cars. In many respects the public is better served than before, but complaints have been made because of the longer waits between cars and their crowded condition. The purpose of the management has, however, been accomplished in reducing expenses, and the returns to the stockholders will probably be larger than in the past.

Boiler Insulation.

The undersigned, having been appointed a committee of the American Railway Master Mechanics' Association to consider the question of boiler insulation, ask for answers to the following questions:

Do you use any kind of insulating covering for your boilers other than wood?

If so, what has been your experience, compared with wood lagging, from an economical standpoint?

If you have made any tests, please give committee the result, setting forth the manner of arriving at same.

Give cost per square foot applied and kind of lagging referred to, the latter for the information of your committee only.

If any experience with lagging the sides and heads of boilers, please give your experience.

If any experience in improved method of lagging steam chests and cylinders, please give in detail the manner of doing it.

Please give your committee all the information in your possession bearing on this subject, as well as any suggestions which, in your judgment, will be a benefit in preparing an intelligent report.

Answers should be sent to J. H. Manning, Master Mechanic U. P. Ry., Omaha, Neb. This is signed by J. H. Manning, J. T. Deems, Wm. McIntosh, Committee.

RAILROAD GAZETTE

ESTABLISHED IN APRIL, 1856.
Published Every Friday,
At 32 Park Place, New York.

EDITORIAL ANNOUNCEMENTS.

Contributions.—*Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies in their management, particulars as to the business of the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and railroads, and suggestions as to its improvement. Discussions of subjects pertaining to* ALL DEPARTMENTS *of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.*

Advertisements.—*We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay,* EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and those only, and in our news columns present only such matter as we consider interesting, and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers, can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.*

We notice by the *Toledo Blade* that Mr. Kayler, State Railroad Commissioner of Ohio, and Mr. Ray, Secretary of the Illinois Commission, are still engaged in their effort to aid railroad employees, "from president down . . . in making better use of their opportunities as voters." A meeting was announced to be held in Toledo, with a list of vice-presidents which used up five inches of type. Meetings have been held in Chicago and Columbus. An "American Railway League" is what these gentlemen seem to be trying to form, and it has been stated somewhere that the organization thus named is already established in ten states. The most specific statement among the mass of generalities published is that railroad employees hope by means of this organization to make their political activities useful *with* instead of *against* those of their employers. It seems to us that these state railroad officials would much better serve their friends, the railroad employees, and their employers, the citizens of the states where they respectively reside, by confining their activities to one state each and letting the other nine (or eight) look out for themselves. The object of the proposed league is avowedly political, and as politics should have no attention whatever in a railroad commissioner's office we may go further and state that it is a gross misuse of a commissioner's time to be getting up political clubs, even in his own state. One might admit that railroad employees ought to be instructed how to vote on matters concerning their employers' interest, and that a railroad commissioner was a suitable person to give such instruction, but still he would have to object to the use by such an officer of his time and influence for that purpose, for that is not what he is hired for. Our most efficient and most respected government officials are those, like officers in the army and the navy, who abstain from all political activity except that required to intelligently cast their own individual votes. The most efficient and most respected railroad commissioners are those who are most free from political entanglements; such as those of Massachusetts and of England. The glittering generalities of the promoters of the "American Railway League," about "working in a broad-minded way for the welfare of all railway men" and the "need of an organization by which they can give better effect to their power" are the very opposite of what should be presented to the railroad employee, or to any other citizen. The railroad employee's political power is the power to vote for honest and fit men for public office in his own town and state. He is first a citizen and then a railroad man. He had better combine with ten good men, railroad or non-railroad, near his home, than with a thousand somewhere else, even if the thousand do precisely the same work that he does, on a caboose of the same color or in a shop where the benches are the same height as his. The railroad man, like every other citizen, can affect federal legislation only by his vote for Congressman, and as public spirited Congressmen necessarily make railroad legislation secondary to numerous other matters, an election cannot rightfully be made to hinge on a railroad issue, and the citizen railroader can therefore do nothing better than to simply seek integrity and intelligence in his candidate.

Railroad men can get an idea of how pernicious a class organization is likely to be in politics by observing the doings of the bicycle riders in the various legislatures recently. If the brakemen and shopmen who are following Mr. Kayler have not noticed what has been going on they can find out by asking their passenger agents or the train and station baggagemen. The laws requiring the transportation of a man with a bicycle at the same price charged a man without one have been secured simply by the "bluffing" of the bicycle clubs. The members of the clubs being numerous, the legislatures have bowed to their wishes because the wishes are supposed to be backed by numerous votes. What little reasoning has been offered to support the demand for the law has been false—such as the claim that as a bicycle weighs no more than a handbag it should not cost the passenger any more to have it carried. The chief weapon of a class organization is generally the power of numbers, and, in the case of this league, such appears to be the frank avowal of the leaders. Such power in the hands of an inexperienced leader is dangerous. He can be trusted to act wisely - he should trust himself—only when his aims are very clearly defined. The only definite aims that we find in this Ohio manifesto are (1) to oppose laws reducing passenger fares to two cents a mile and (2) to promote laws making compulsory the use of interlocking signals at railroad crossings. What influence can railroad men have on passenger-fare laws? In a "railroad town," where a thousand or two shopmen constitute a majority, they could make an issue and easily triumph; but an overwhelming majority of the people of every state desire to have fares fixed at one cent, or half a cent, a mile, not three cents; and their wishes will control their votes. To convince them that two cents is too low, they must be shown why the railroads already carry so many people at that rate. They will demand convincing arguments rather than mere expressions of urgent wishes. A minority must back up its claims by reason. A league whose power is in numbers alone must be sure that the numbers are sufficient. How can it be shown that a reduction of fares would lead to a reduction of railroad employees' wages? An appeal to past experience might illuminate the question on the wrong side. What do the members of the league care about interlocking, more than other citizens would? Good signals are valuable chiefly to passengers, saving their time by making higher speed possible, and promoting their safety. But a good law requiring such signals is not an easy thing to get up. Quite recently we had occasion to point out the looseness of the law on this subject in Ohio and other states. As there are great difficulties connected with prescribing the details of such a statutory requirement, its value and efficiency depend upon the courage, knowledge and skill of the state official appointed to enforce it; and we found not only that laws were loose but that commissioners seemed to lack the energetic grasp of the subject necessary to make the laws effective. This being so, any state that wants the best signals at grade crossings can get them most surely by employing a commissioner who knows where to go to get them, and how to induce railroads to use them. Such a commissioner will be worth much more than one who can control 50,000 votes in favor of an interlocking law.

Interstate Commerce Commissioner Knapp, who delivered an address in New York City last week,* laid before the merchants the two principal facts concerning the law which now call for public attention: (1) that district attorneys and grand juries are the officials to detect illegal rate cutting, not the Interstate Commerce Commission, and (2) that the fifth section of the law, prohibiting pooling, is contrary to the spirit of the other sections of it. Commissioner Knapp was already known to favor the legalization of pooling, but in view of the apparently half-hearted state of mind of some of the other Commissioners, he deserves special commendation for speaking out plainly. It is passing strange that the opponents of pools are so exceedingly cautious about accepting the arguments in favor of them. The fact that every one who wishes to revivify the Interstate Commerce law by repealing the fifth section confines his argument to that one point, seems to be taken by the other side as good evidence that pooling is in itself a sure cure for all ills, and that to grant the friends of pooling this one thing will give them too sweeping a victory; will be allowing the cure to be made too exclusively by one school of doctors Yet, as every one knows, the pools that were in existence during the last few years preceding 1887 were anything but sovereign remedies for rate troubles. Many of them were little better than the agreements of the last 10 years. Those who argue for pools now are compelled by force of circumstances to emphasize as much as possible the good that can be hoped for from them; but the stubborn fact that even these will still leave much to be desired is constantly staring us in the face.

Mr. Knapp presents a temperate argument in favor of empowering the Interstate Commerce Commission to decree relief to aggrieved shippers the same as a court would; and a claim so moderately presented, by one who has had experience on the Commission, demands considerate attention; but the marked differences between the Commission and our courts of justice are passed over without comment. These differences constitute the main argument against the expansion of the authority of the Commission. The judges of our courts hold office for long terms, or for life, and are thus free from the influences of party politics; the Commissioners' terms expire every six years, and the Commission is liable at any time to become subject to that influence. In the courts, judgeships are given to eminent members of the legal profession, and so we have the benefit of high character and long experience; but commissionerships have not yet become desirable simply as positions of honor; and, the salary being moderate, the appointing power has not always succeeded in finding strong men to fill the places. The Commission differs radically from the courts in that the law requires it to cover too much ground. The only court that deals with the whole United States is the Supreme Court. Granting, for the sake of argument, that the Interstate Commerce Commissioners are as wise as the Supreme Court justices, we still have the great difference that the court deals only with issues that have been already discussed and clarified by local courts This, and the complicated technical checks and restrictions that have grown up in the courts in the course of the last 150 years, with the fact that the highest court possesses in the highest degree the desirable attributes that we have mentioned, constitute a great safeguard against harmful decisions, and it is not easy to see how the Commission can be made the beneficiary of such a safeguard. It is too young, and there is still about it too much of the political and non-judicial atmosphere that has surrounded it from the first.

It may be said that as many unsound decisions have been issued in railroad cases by the lower United States courts as by the Commission. Whether this is true or not, we do not know. But even if so, the arguments which we have mentioned still have much logic to sustain them, and anyone who has to submit to an unpalatable decision from the courts has at least the consolation that the state has done by him the very best that it knows how. The chief argument in favor of a national transportation commission is that thus we may have a body of experts in that special department of the law; but it cannot be said that our first ten years' experience has done much to justify that argument. The only member of the Commission in all that time who has entered his office with both ability and extensive railroad experience, added to the judicial temper, has been Chairman Cooley, and even he showed by some of his acts that of the two parts of the supposed double function of his office—that of judge and advocate—he thought it his duty to be at least half of the latter. While always abhorring injustice, in whatever form, he still seemed to feel called on to secure justice for one party rather than to declare it with cold impartiality as between two equal parties. Indeed, as we all know, this dual nature of the Commission is the first thing that ought to be got rid of if the body were to be clothed with additional powers. On the whole, it seems to us that our experiment of a Federal railroad commission must be considered as still in its first stage. It has not been shown that judicial and administrative functions can be successfully combined in the same body; nor that lawyers alone, however good lawyers they may be, make the best commission; nor that a single central body can deal judicially with transportation questions any better than can the United States district courts, acting in their respective districts. Even as respects the most useful function of a commission, that of adviser and helper of small shippers with big grievances, we are not

* See page 780.

sure that our experiment has been wholly in the right direction. Who can say that Congress would not have done just as well to appoint a half dozen specially qualified district attorneys in different parts of the country? We should not be surprised to learn that the "freight commissioners" employed by the merchants in some of the Western and Southern cities had done as much for their several communities as ever a federal commission has done or could do. This is a very big country.

British Railroad Employees.

Of all concessions to the working staff of British railroads none probably has been so important as that lately made by the North Eastern. This company, after the great strike at Newcastle last spring, consented to refer to arbitration the whole question of rates of pay and hours of labor. The result was an award, by Lord James of Hereford, which is estimated to imply for the companny on extra expenditure of something like $125,000 per annum. The North Eastern has always had the reputation of being a generous employer, and the money by itself represents no inconsiderable concession. But the concession of principle in accepting an arbitration in the matter at all seems even more important. The Chairman of the company stated the views of the directors on this matter very frankly at the half-yearly meeting. The Board considered that they could have fought their men and beaten them. But a fight would have cost both the company and the men dear and would have dislocated the trade of the entire district. Further the Board believed that the staff had confidence in their desire to deal fairly and justly in the matter of wages, and they thought that that spirit of confidence would be strengthened if the Board showed its readiness to accept the decision of an impartial tribunal. A bitter and prolonged strike would inevitably have upset the cordial feeling between staff and Board for many years to come.

The award of Lord James deals minutely with details as to the wages and hours. All the signal cabins on the line, for instance, are classified as first, second and third class, with separate scales of wages for signalmen, assistant signalmen and signal lads in each. For ticket collectors there are five different classes set out; for platform porters, four classes; for foremen porters, six classes, with scales of wages assigned to each, their yearly increase and the number of hours which a week's work is to consist of. According to the organ of the men's trade union, the leading features of the award are in the case of almost all classes of staff "the independent and guaranteed day, overtime rate of time-and-a-quarter, Sunday duty clearly defined and paid for at time-and-a-half, and an equalization of wages." In other words each day's work, whatever be its recognized standard length—this varies from 8 to 11 hours according to the class of workman—is to stand by itself. If a man comes on duty he is paid for the day even though he may not work the whole of it; if he works beyond his regulation time he is paid at the rate of time-and-a-quarter for each extra hour worked. On most English railroads there has been great divergence of practice on these points. But it has hitherto been, we believe, a universal rule to take not the day but the week as the basis of calculation. In other words, a man who only worked a total of 48 hours in the week would have no claim for overtime pay, either extra in amount or extra in rate, though on one or more days in the week he might have worked 12 or 14 hours. Against this method of calculation the men have long protested, and at length with success as far as the North Eastern service is concerned.

The other companies are far from approving the precedent which the North Eastern has set. But it is quite certain that they have not reached the end of the increase of wages and decrease of the hours of work, whether this result be reached by arbitration, by strikes or merely by voluntary concession.

The Board of Trade figures indicate how much the men gained in 1896. The reports for the first half of 1897 and the chairmen's speeches at the various half-yearly meetings show how much more they have gained since. Twenty-three of the principal English railroads, excluding Scotland and Ireland, earned in the first half of 1897 £1,300,000 more than in the corresponding period of 1896. Practically three-quarters of this went in increased working expenses and of these working expenses wages are the main item. On the Great Northern for instance, out of £57,000 increased working expenses increased wages account for £43,000.

Another matter likely to cause considerable additional expenditure to the companies and advantage to their men is the Workmen's Compensation Act lately passed through Parliament. This act does not come into force till next year and it is too soon yet to attempt to describe its precise mode of operation. The companies will incur large liabilities for accident to any employee unless caused by his own personal misconduct. The question of allowing workmen to "contract out of the act" as it is termed, in other words, to agree not to claim the benefit of its provisions, was much discussed during the progress of the bill in Parliament. As the matter is left the workmen employed by any given employer may agree to forego their rights under the act if and so long as a government official, the Registrar of Friendly Societies, certifies that the employer has made provision insuring to his workmen compensation in case of accident at least not less advantageous to them than the terms which the act of Parliament would secure to them in default of agreement. It does not appear, however, that this provision will have any practical effect, as far at least as railroads are concerned, for all the chairmen of the great lines possessing voluntary accident insurance funds who have spoken on the subject have expressed themselves as clearly of opinion that these voluntary funds will have to go.

Annual Reports.

Missouri, Kansas & Texas.—The annual report of this company for the year ending June 30 last reflects past conditions, and the results reported must be viewed in that light. Considering the circumstances under which the road was worked during the greater part of the year, high earnings were not looked for. The total for the year is, however, $441,328 above 1896, but less than in 1895, when the mileage was also less. But the gain is equal to only four per cent. and almost all of it was made in the first three months of the fiscal year, the earnings for this period being $310,551 above the corresponding months of the previous year. But the company was not able to hold any part of the gain in gross for the net earnings, expenses increasing $633,301. There was, therefore, a decrease in net receipts of $191,973, and a deficit of $149,353 on the year's operations, against a surplus of $16,393 in 1896. The general results of operations for three years follow:

	1897.	1896.	1895.
Gross earn.....	$11,478,315	$11,035,987	$11.544,363
Oper. expen. and taxes	8,337,401	7,701,100	8,421,184
Net receipts.....	$3.140,914	$3,332,887	$3,123,179
Interest and rentals...	3,427,267	3,316,494	2,898,440
	$286,353	.....	.....
Other income.....	137,000	.....	.....
Balance.....(def.)	$149,353	(sur.) $16,393	(sur.) $224,739
Av. miles oper.....	2,197	2,147	2,028
Gross earn. per mile..	$5,224	$5.140	$5 692
Net earn. per mile....	$1,429	$1,552	$1,540
P. c. of expen. to earn.	73	70	73

The miscellaneous income, $137,000, which appears in 1897 for the first time in the company's report, represents the direct profit on the coal mining operations which are conducted through subsidiary coal companies. The growth of the coal traffic has been marked in recent years. In 1894 763,480 tons were carried, and in 1897 915,624 tons. Besides the profit from the coal properties, through the tonnage obtained, the company has begun to receive dividends on its stock holdings in the coal properties. One other noticeable point in the development of the company's traffic is the growth of the grain tonnage. This is no doubt attributable to the rise of Galveston as a grain exporting port. In the calendar year 1896 Galveston exported nearly 6¼ million bushels of corn, and in 1895 only 1¼ million bushels. The wheat exports in 1896 were 3½ million bushels, the amount going out in 1895 not being reported. In the eight months to Aug. 31, 1897, the corn exports were 3,904 thousand bushels.

The direct effect of this movement on the fortunes of this company is shown by a few figures of this class of tonnage. In 1894 the company carried 229,000 tons of bulk grain, this being 9.36 per cent. of the total tonnages; in 1896, 342,000 tons were moved, and in 1897, 639,000 tons, the proportion to the total tonnage being 19.7 per cent. Since 1894 this tonnage, it will be seen, has practically trebled. Of course the rates are low, but it is moved in bulk, and there is a long haul, the company's lines being advantageously situated in this respect, so that the grain goes over its own lines from Kansas to Galveston.

Certain traffic statistics follow:

	1897.	1896.	Inc. or dec.	
Tons moved.....	3,236,906	2,926,337	I.	310,569
Ton mileage	1,017,781,597	846,827,435	I.	170,954,162
Freight train miles..	6,468,812	5,683,432	I.	785,380
Pass. carried.....	1,347,523	1,652,985	D.	305,462
Pass. train miles.....	3,188,310	3,135,540	I.	52,770
Pass. mileage.....	78,375,002	89,837,595	D.	11,462,593
Ton mile rate (cents).	.895	.991	D.	.096

The number of passengers carried fell off 18.4 per cent. and the number of miles traveled 12.7 per cent., with a consequent decrease in passenger revenue, which was $253,000, or 12.2 per cent. less than in 1896. But the passenger train mileage increased slightly, about 1½ per cent. The freight statistics show an increase in revenue of $718,663, or 8.5 per cent., [the tons moved being 10.6 per cent. greater, while the ton-mileage was 20.1 per cent. heavier; the freight train mileage increased only 13.8 per cent. A longer train haul and heavier trainload helped to bring about this economy in train mileage. The trainload was 149 tons in 1896 and 157 in 1897, and the train haul was 289 miles in 1896 and 314 miles this year. The freight train mile earnings do not make so favorable a comparison, falling from $1.47 to $1.40.

A good deal of improvement work has been carried on by the company inrecent years. Charges for new construction work have formerly been made out of a fund consisting of securities received from the Reorganization Committee. This account is now to be called the improvement fund, and is carried on the books as valued at $776,316.

The General Manager's report states that 17 wooden bridges and trestles have been replaced with steel and masonry; eight combination iron-and-wood bridges have been erected, and several wooden culverts renewed in steel. This will lessen the cost of maintenance, and permit the safe use of heavier power and trains. During the year 11,000 tons of 60-lb. rails were purchased, and the General Manager states that by laying these rails where traffic is heaviest enough rails will be released to meet the renewal requirement of the next three years. About 60 miles of stone and burnt clay ballast was used, and contracts have been made for 200,000 yards of burnt clay ballast for the Texas lines this year. Most of the rolling stock has been fitted with air brakes and automatic couplers. During the year most of the passenger cars have been equipped with train gates.

The British Board of Trade accident report, for the first half of 1897, which is just at hand, gives the report of Lieutenant-Colonel Yorke on the disastrous train wreck at Welshampton on the Cambrain Railway June 11, when 11 passengers were killed and 15 injured, the number of passenger fatalities thus being larger than the total in train accidents for all the railroads in the United Kingdom for the two years 1895-6. This derailment happened at 10 o'clock in the evening and the train was an excursion, carrying 330 passengers. The report takes takes up 16 large pages and goes into the usual details of the weights of the engines and cars, the year when each car was built, the minute description of the ground where the accident occurred and the testimony of each witness; but the essence of the report may yet be summed up in the statement that the track was poor, the train, drawn by two engines, was running at about 45 miles an hour, and that one of the two tenders, which were fully loaded with coal and water and were six-wheel, with a wheel base only 12 ft. long, undoubtedly oscillated to such an extent as to throw the track out of line and thus jump the rails. Colonel Yorke found decayed sleepers and loose spikes all along the line in the vicinity of the derailment. The rails were good quality, but were old and worn. There was an empty four-wheel van in the train next to the tender and it was suggested that that van, which rode very roughly, was the first to jump the track, but Colonel Yorke thinks that as the tenders weighed 31 tons each and the van only 10, while the latter had a wheel base 15 ft. long, the probabilities are all in favor of the theory that the tender was the first to jump off. (The locomotives were not derailed.) As to the danger of running a four-wheel car in the front of a heavy train Colonel Yorke says that it is not a question of the number of wheels, but of the relative weight of the car as compared with the total weight of the train behind it. The risk of the front car being squeezed off the track is the same whether the other cars are four-wheel or eight-wheel.

The State Railroad Commissioners of New York have sent to the railroad companies and the Municipal Highway Commissioners of the state a circular calling attention to the fact that at many crossings of highways with railroads weeds and underbrush are allowed to grow to such an extent as to impair the view which persons approaching on the highway can have of the railroad; and the request is made that such places be cleared. The Railroad Commissioners find that the highway law is not complied with by highway commissioners and overseers, and they recommend that where there are obstructions on a highway or on private property which interfere with a proper view of the crossing, and the co operation of the Highway Commissioners cannot be secured, the railroad company take steps to acquire the right to remove such obstructions. This circular is occasioned by the conclusions reached by the Railroad Commissioners in their investigation of the highway crossing disaster on the Long Island Railroad last May.

NEW PUBLICATIONS.

Water Supply. (Considered principally from a Sanitary Standpoint.) By William P. Mason, Professor of Chemistry, Rensselaer Polytechnic Institute. New York: John Wiley & Sons, 8vo. pp. 480.

A good time to review a valuable book is about the period at which a second edition may be expected to be in preparation. When Professor Mason's compendium of facts and theories regarding the sanitary aspect of water supply was issued about 10 months ago, while we recognized its value, it seemed better for several reasons that an extended notice of it in our columns should be deferred for a season. There were too many facts and too many footnotes in it to be digested hurriedly or commented on at short notice. In the matter of footnotes particularly the volume is prolific. They are not by any means confined to references to authorities, which are always desirable, but a great number of them consist of addenda to the text and explanations of the matter in the text, producing the impression that the copy had been too hurriedly sent to the printer. To the college student this does not make much difference, but to the busy man who wants a book of reference from which an illustration, an argument or a confirmation of a state-

ment can be drawn at a glance, footnotes modifying or expanding the statements in the text are a nuisance. There is no use for them in a properly digested book. Other evidences of hasty preparation are found in several misprints, a few of which are corrected on a slip of "errata" inserted at the end of the volume, while others, such as Lake Maeris, Rancocus, *riffles*, temperature differences *is*, and others still mar the text. Some little personal touches, too, such as quotations from reports by the author to the authorities of towns unnamed, where a statement of principles would have done as well, and allusions to devices "invented by one of the author's students," betray the novice rather than the expert. But the book shows wide reading, considerable experience in analysis and generally good judgment in the selection of illustrations of the facts presented.

The first chapter, of course, goes back to Pliny and Herodotus and the water supply of ancient Rome. No treatise on water is complete without that. The second chapter treats of drinking water and disease, for 89 pages. This is an interesting and valuable compilation of data relating to the bad effects of impure water. The chapter concludes with a disquisition on the value of a human life, which is estimated at $2,000 and $25 additional for a funeral. One case cited on p. 14 seems to show that a good many of the deaths attributed to bad water might be avoided if people were only careful "not to drink water on an empty stomach."

Chapter III. treats of artificial purification of water. Various methods of filtration are quite fully described, in 74 pages. More uniformity in the mode of presenting results would be desirable. Thus on p. 113 the analysis of the unfiltered water is placed first while on p. 123, in a similar case, the filtered water is given first place. So on p. 131 the number of bacteria which appeared in the effluent from a filter is given while in other tables the number of bacteria retained by the filters is stated. This is confusing to one who has to use the book for reference. Full and interesting figures are given of the efficiency and cost of various filters, but it is a little out of place in a work like this to give a patentee's estimate of what his particular scheme can do, before it has been tested on a large scale, as is done on p. 144. The author's conclusion at the end of the chapter is that there is not "any value in coloring water with wine before drinking it, a custom so widely observed in Europe."

Chapter IV. devotes 30 pages to the natural purification of water by aeration, sedimentation, freezing, sunlight, etc. This chapter is not very well digested or systematized and is not harmonious in itself. For instance, on p. 175, the author describes an experiment of his own, of putting about three pints of diluted sewage into a bottle which be attached to the connecting rod of an engine running at such speed that the water was "subjected to 9,000 violent concussions and traveled 1.25 miles" in an hour. After several hours shaking in this way the water was analyzed, and from the results the author concludes that "direct oxidation does not seem to be a factor of any considerable importance in the purification of polluted water." On the other hand, on p. 186, it is stated that in the Illinois and Michigan canal, where the water is agitated by passing boats and by locks and dams, "very considerable self-purification takes place during the flow of 33 miles." The bacillus which produces nitrification, described on page 171, appears to possess some very human characteristics in that it cannot thrive if too well or too highly fed, or has not enough oxygen supplied to it.

Chapters V., VI. and VII., devoted respectively to rain, ice and snow, river water and stored water, occupy 86 pages and contain a good deal of valuable matter gathered from many sources. It is unfortunate that no allusion is made to the most complete record and analysis of notes on evaporation and its bearing on water supply that has been published and which is to be found in the Reports of the New Jersey State Geologist.

Ground water is treated in Chapters VIII. and IX., of 61 pages, largely a collection of curious facts and some fanciful theories. The chemical and bacteriological examination of water occupies 90 pages and is well elucidated. Two more chapters, which are devoted to statistics of daily supply to towns and the action of water on metals, conclude the book, which is worthy of a second edition, revised, corrected and somewhat abridged.

Metallic Structures; Corrosion and Fouling and Their Prevention. By J. Newman. New York: Spon & Chamberlain, $3.50.

A great deal has been written within the last few years regarding the preservation of metallic structures, but it is doubtful if any such complete presentation of the case has ever been made as that contained in the book under review. The author deals not only with the various substances which are used as coatings for a protection against rust, but he makes careful analysis of the causes of the corrosion itself. He deals carefully and fully with these causes, and states positively that oxygen alone does not produce corrosion. Careful experiments (which are given in detail) tend to show that carbonic acid, and not oxygen or aqueous vapor, is the agent which determines the magnitude of the oxidation of iron in the atmosphere. The conclusion is therefore drawn that carbonic acid in a damp atmosphere is a powerful and active agent in causing corrosion. He details also the results of certain experiments made to show the effect of the variations of temperature; also that of small quantites of carbonic, sulphuric and sulphurous acids in the corrosion of iron and steel, and the influence of the two latter substances were particularly shown by the rapidity of the corrosion which takes place in iron manufacturing districts where large amounts of sulphuric and sulphurous acid are brought down by the rain. He shows, further, that it is not only the condition of the atmosphere and liquids in which an iron structure may be submerged that determine the amount of corrosion, but that the quality of the metal itself has a very important bearing upon the subject.

The corrosion of cast iron and steel are treated in a chapter by themselves, as well as the relative corrosibility of steel, wrought iron and cast iron. Cases of rapid corrosion are given with the probable reason therefor, and a chapter is given to the corrosive influences of certain soils. The matter of the galvanic action in corrosion is treated at length, and a list of metals of the positive and negative ends of the galvanic battery are given, showing exactly what may be expected and what metal will be corroded, provided contact is made between any two.

There is one point which is dealt with carefully and which is often neglected or overlooked; the influence of the design and workmanship on corrosion. Wherever bars or cross-pieces are bolted or riveted together, water will work into the interstices and the deflection and vibration of the parts of the structures caused by traffic or shocks accelerates any corroding action. If this principle were to be applied to the workings of the bars of the ordinary diamond truck, much of the corrosion that occurs in them would be explained. Especial care, it is stated, should be taken regarding the straining of the metal that its limit of elasticity is not exceeded, for when this is done there will be a very serious deterioration, and one which will be almost impossible to stop.

In Part Second the author deals with the prevention of fouling and corrosion in submerged structures and in ships, and the first chapter is on the fouling by scum, mud and marine plants, followed by one on fouling by mollusca, coral and marine plants, and that due to the temperature and salt of the sea. The final chapters are taken up with the means of prevention of fouling and with notes on the oils, gums and resins that are used in paint, to which are added some notes on lead and cheap paints and the requirements of an anti-corrosive paint.

Mr. Newman sums up the principal properties required in an anti-corrosive paint or one that is spread on bare iron and steel to be as follows:

1. It must, without deterioration, absorb moisture or dampness that may be present upon the plate or in the pores of the surface metal.
2. It must be homogeneous, complete incorporation of the ingredients of which it is composed being attained.
3. It must form a hard, smooth, even, glossy and uniform coating, impervious to air and moisture, thereby preventing corrosion, and have no injurious effect on the iron or steel or the second coat of paint.
4. It must adhere very tightly, evenly and firmly to the bare iron or steel plate, and yet possess the elasticity sufficient to prevent cracking, scaling or blistering when a structure is strained or vibrates, as bridges subject to a quickly rolling load, or ships, also from any contraction or expansion of the metal.
5. It must present a surface that the second coat will easily spread upon and very firmly adhere to without affecting its quality or setting up any deleterious action, and without blistering either of the coats, or becoming cracked or chipped from vibration.
6. It must dry reasonably quickly, without any sacrifice of durability, in order that the second coat may be applied within an hour or so after the first coat.
7. It must be easily applied, and ready mixed for use, only requiring to be thoroughly stirred, and that no thinning or heating may be necessary.
8. It must not be deleteriously affected by climate or the usual variations of temperature.
9. Its life should be considerable; and it should retain its preservative qualities until the established law of the decay of all materials has naturally become too apparent in it.
10. Only two coats should be required, and not more than three when it is exceptionally exposed; it must flow easily, spread readily, and have considerble covering properties.
11. Its weight must not be excessive, and its cost must be moderate.
12. It should prevent galvanic action, and act as an insulator of electricity.
13. It must not be explosive, produce explosive vapor, or be readily inflammable.

The Metallurgy of Cast Iron. By Thomas D. West. Small octavo, 573 pages, illustrated. Cleveland (Ohio): Cleveland Printing & Publishing Co. Price $3.

Mr. West is well known among foundrymen through his earlier books, "Foundry Practice" and "The Moulders' Text Book." On the title page of this last book he says that he is a practical moulder and foundry manager, which is doubtless true enough, but he obviously knows little of the metallurgy of iron. There are so few reliable treatises to be found on this subject that it is much to be regretted that Mr. West should have collected so much misinformation. Indeed most of those who would be likely to buy this book will have little chance to compare it with more reliable treatises and will therefore accept the author's conclusions as trustworthy. Thus the book is calculated to do more harm than good and the reviewer has a certain duty to perform with regard to it. The book purports to give reliable information on coke making and blast furnace practice and the chemistry of those subects, but most of the statements are not in accord with facts, and many of them are ridiculous.

TRADE CATALOGUES.

Where and How to Go is the name of a little 4 in. × 8 in. pamphlet issued by the passenger department of the Brooklyn Heights Electric Railroad, of Brooklyn, N. Y. It contains, alphabetically arranged, the routes of all lines, transfer points and night schedules of the Brooklyn Rapid Transit Co., controlling the Brooklyn Heights Railroad, Brooklyn City Railroad, and Brooklyn, Queens County & Suburban Railroad, with over 50 fine halftone engravings of the more prominent points, including Fort Hamilton, Ulmer Park, Bergen Beach, Jamaica, Flushing and North Beach. There is tipped in each book an attractive map, designed especially for the publication, giving distinctly the name of every street in Brooklyn proper, all ferries to New York and outlying suburban villages and pleasure resorts. The lines of the company are prominently marked.

Light Cars.—The Sheffield Car Co., Three Rivers, Mich., sends a new edition of its general catalogue, together with a circular on mining cars and wheels. The general catalogue consists of nearly 100 pages and contains descriptions and illustrations of many kinds of velocipede and hand cars, together with information regarding a large variety of miscellaneous cars, such as weed-cutting cars, logging cars, various dump and push cars, and plantation cars, all of which are illustrated. Besides this the catalogue also contains cuts and descriptions of the railroad standpipes and equalizing electric motor trucks made by the Company. The circular on mining cars and wheels is not confined to these articles alone, but illustrates and describes a number of other articles of interest to miners.

The Girdle Book is the title of a handsome pamphlet of about 125 pages, issued by the passenger department of the Union Pacific, giving information for travelers and describing prominent features of the scenery on the journey from Chicago around the world by way of Omaha, San Francisco, Japan, India, Egypt, London and New York. The text seems to have been prepared with much care, and the pictures, which are printed in colors and appear on every page, are very attractive While they represent scenes which for the most part are familiar to most readers, they seem to be new, and the reader's interest is not dulled by the feeling that the book is a rehash of old material.

The Morgan Signal Co., Ypsilanti, Mich., has issued an eight-page pamphlet describing the pneumatic railroad signals made by the company. Drawings are shown in which the company's apparatus is adapted to distant switch signals and highway crossing signals. It is suitable also for block signals. It is stated that the track instrument has been in use five years, and the pneumatic pans, by which the air impulse is made, have been tested 3½ years.

Mr. Blanchard on Trusts.

Mr. George R. Blanchard, Commissioner of the Joint Traffic Association, made an address before the New York Board of Trade and Transportation last week, in which he explained the nature of railroad pools, and set forth the facts which go to show the fallacious character of the arguments presented by those who declare pools contrary to public policy. He condensed his definition of a pool into 20 words, describing it as simply "an agreement between rival roads to apportion the tonnage or earnings of competitive traffic carried at like rates previously published." Reasons why it is impossible to maintain just and reasonable rates without a pool were stated to be: Because rival routes differ in facilities to gather, carry and distribute traffic; because different localities strive for advantage; because some large shippers are persistent pleaders for preferences, and may shift their traffic from line to line and combine their tonnage with others to deplete rates; because combinations of roads and shippers jeopardize the rewards due to business probity, skill and capital and establish reduced rates for other roads; because most large shippers oppose legal or railway methods to stop rebates, because the national law gave no helps to better conditions. Among the differences pointed out between pools and trusts were: Trusts combine rival interests to control buying or enhance sale prices and to restrict or annihilate lesser competition. Trust prices are not legally required to be publicly posted. Trusts do not currently report their incomes, prices or profits to public authorities. Trusts may grant various sale terms and preferences, or decrease production to increase gains. Contrariwise, interstate railway rates must be filed with the commission named by the President, confirmed by the Senate, and divided politically. Railway companies must make detailed reports to their charter states or to the national government, or to both. They cannot combine to advance charges, but must determine them with reference and deference to law, to potential and ceaseless elements of natural competition, and to irrational and wasteful strife. Their rates and fares are subject to legal review. They must not charge more between local points than between the next farther common points.

Continental Express Speeds and Accommodation.

BY J. PEARSON PATTINSON.

I.—*The Belgian State Railroads.*

In the following article the information relating to gradients, locomotives and the statistics of express speed are all taken from official sources and may therefore be deemed accurate. Official information has been supplemented by personal observation on the part of the writer In this article we deal with the State Railroad system of Belgium, and the information presented is grouped, for convenience, into the headings: (1) General description of the line; (2) rolling stock for passenger trains, station and other accommodations; (3. locomotive dimensions; (4) gradients on principal lines and (5) statistics of express speed, with notes on the working schedules, or (as we say in England) the working time tables of the company.

(1) *General description of the line.* Taking Brussels as a center we find lines of importance radiating in all directions. To the west is the line to Ostend, whence the boats run in connection with the express trains of the State Railroad; to the north is the Antwerp line, with connections to the Netherlands; to the east, the great artery to North Germany runs via Louvain and Liége to the frontier station at Herbesthal; to the southeast the line to Luxembourg and Alsace traverses the

picturesque Ardennes through Namur and Arlon. All these important lines are, of course, double-track and have their headquarters at the Brussels (Nord) station. The lines, however, to the French frontier and the south-west of Belgium generally, serving such important towns as Mons, Tournai and many others, leave the South (Midi) station at Brussels.

It would simply be confusing to attempt any description of the less important branches of the Etat Belge, which spread like a net over the whole of the country and are more frequently than not single-track only. The best idea of the importance of the system may, however, be obtained when it is stated that the annual receipts are more than £6,000,000 per annum (one-third of this from passengers), the passengers number 75 millions, each being carried an average distance of 14 miles at an average fare of about 0.5 pence per mile. The working stock consists of about 2,200 locomotives and 5,500 vehicles used in passenger traffic. The length of line is over 2,000 miles (nearly 1,300 of this being single track).

(2) *Rolling Stock for Passenger Trains, Station and Other Accommodation.*—To those accustomed to the luxuries of American dining, sleeping and parlor cars, the passenger rolling stock of the Etat Belge will offer but little attraction. With the exception of a few vehicles mounted on eight wheels and weighing about 33 tons, provided with a side passage, all the vehicles in use in Belgium (leaving tramway trains out of consideration) are of the English compartment type, and are, as a rule, mounted on six wheels and ride rather roughly. The first-class compartments are nearly always upholstered in red-figured material and the seconds in brown cloth. The firsts are arranged to seat six passengers, the seats being divided by arm rests; the seconds give accommodation for 10. But for this, and for some little extra decoration and ornamentation in the firsts, both classes are almost equally comfortable. Lavatories are, in the through trains, frequently provided for both classes.

The third-class vehicles are much inferior and much like the types of this class in other European countries. The seats are uncushioned and the window space very limited, and luggage racks are not always provided. The newer vehicles are, however, clean, but the amount of cubic space allotted to each passenger is painfully small. Each compartment is furnished with an *appel d'alarme*. The lighting, however, of the stock is not in a very forward state.

Station accommodation in Belgium, once one gets accustomed to the climb from the universal low station platforms to the carriages, is very good. Many roadside stations are very ornate structures with excellent waiting room accommodation. The more important towns have also in most cases really fine stations. The waiting-rooms are almost always good and spacious. Those at Ostend Ville and Bruges are most artistically treated and well worthy of inspection. The station at Bruges is, indeed, with its fine roof ironwork and noble façade, quite a model station for a town of the size. Curiously enough, at many of these large stations there is no restaurant.

The block system is in use on the State lines, and the signals are usually of semaphore form. "Line clear" is, however, indicated not only in the English manner by lowering the semaphore arm to an angle of 45 deg., but also, at many points, in the German manner by elevating the arm to a similar angle. The permanent way on the main routes is kept in splendid condition, the surfacing as well as the fencing and hedgerows bearing traces of sedulous care in upkeep. Level crossings protected by guard-houses are very numerous. Kilometer posts as well as other indicators relative to reduction of speed, etc., are all well looked after and placed so that they can readily be seen from approaching trains.

(3) *Locomotive Dimensions.*—Unlike most Continental locomotives, the machines of the Etat Belge have in nearly all cases inside cylinders. They are, as a rule, ugly-looking engines—the huge square chimney greatly detracting from their general appearance. So far as can be judged, the large express passenger types can do work much superior to any that is required from them in general practice. The dimensions of the various classes will be found collected in the table.

Four types of tenders are in use, with water capacities of, respectively, 7,500, 9,000, 14,000 and 14,000 litres and space for from 3 tons to 3 tons 12 cwt. of coal. The larger tenders are on six, the others on four wheels.

Some curious steam carriages (*voitures à vapeur*) are in use, affording accommodation for about 8 first-class passengers, 15 second and 30 third. The weight of locomotive and carriage combined seldom attains 30 tons, the cylinder dimensions, heating surface, etc., being very small.

(4) *Gradients on Principal Lines.*—With the exception of the line over the Ardennes to Luxembourg and Alsace (see below) the Belgian State railroads are very level, on the whole. The Ostend line is almost as flat as a billiard table, and only at one point, near Dilbeek, is it 150 ft. above the sea. The same may be said of the section between Brussels and Antwerp, the highest point being near Contich, only 65 ft. above sea. Between Brussels and the German frontier at Herbesthal the line is a little more difficult, but nothing to speak of. For six or seven miles after leaving Schaerbeek it mounts at about 26 ft. to the mile, attaining an elevation of about 180 ft., then drops to Louvain, and again rises easily until near Vertryck (about 200 ft. above sea). Then for about 30 miles it keeps gradually ascending at rarely worse than 20 ft. to the mile until Ans, nearly 600 ft. above sea, at which point the well-known sudden drop for 2½ miles into Liége at nearly 170 ft. to the mile is met with. From Liége, only 200 ft. in altitude, the ascent to the German frontier is steady. For 25 miles the grades vary from 15 to 50 ft. to the mile, being worst nearer the frontier, where the elevation above the sea is well over 800 ft. This last part, coupled with the numerous sharp curves met with, is therefore difficult, but the speeds attained over it are very moderate.

We now come to the line over the Ardennes with its ruling grade of about 85 ft. to the mile. For the first 20 miles out of Brussels, until passing Ottignies, some of the grades are 80 ft. to the mile. These are, however never of great length, and the highest point is only 350 ft. above sea (just before Groendael), and again, after an intervening drop, at Rixensart, which is slightly lower in altitude. After Ottignies, however, the ruling grade of 85 ft. to the mile is met with in long and difficult stretches for about seven miles until passing Chastre, after which the ascent eases off a little or is interspersed with short descents. The summit at St. Denis-Bovesse, 32½ miles from Brussels, is over 600 ft. above sea. Namur, seven miles further on, is more than 300 ft. lower, descending grades, often at the rate of 80 ft. to the mile, intervening. Twelve very heavy miles at 85 ft. ascent to the mile, almost unbroken, follow, terminating at an altitude of nearly 950 ft. between Assesses and Natoye. The next five miles consist of a drop at 85 ft. to the mile and an easy ascent to Ciney, nearly 60 miles from Brussels. The ascent again becomes steeper here, being often 50, 70 and 85 ft. to the mile, and seven miles of this takes us just past Haversin, about 1,050 ft. above sea. Three miles of descent at 85 ft. to the mile and a short piece of level are followed by a short but sharp 85 ft. ascent to Marloie, 900 ft. high, and by a similar, but less steep, descent into Jernelle, about 650 ft. The stiffest part of the line is now met with, the whole distance to Libramont, 20 miles, being on steep ascending grades, commencing easily, but ranging from 50 to 60 ft. per mile after Grupont, and from 70 to 85 ft. (the latter more usual) after Poix. Libramont, the summit, is nearly 1,600 ft. above sea, and in the next seven miles the line does not drop more than 200 ft. below this elevation, although on continual ups and downs at 85 ft. to the mile. From this point, however, to the frontier at Sterpenich there is nothing against the locomotive except very short pulls at Habay and Arlon. It is, for 27 miles, an almost continuous descent, but rarely severe, the worst parts being for about three miles before Lavaux, where the rate is 85 ft. to the mile, and for the last six miles into Sterpenich, where it varies from 40 to 60 ft. Sterpenich is about 1,050 ft. above sea.

After this heavy route the line between Brussels (Midi) and Mono presents few interesting features, consisting merely of a gentle ascent at about 20 to 25 ft. per mile to Soignies and a similar drop thence to Mono, the highest elevation being under 350 ft. above sea.

(5) *Statistics of Express Speed, With Notes on the Working Schedules.*—The amount of express speed on the Belgian State lines is not considerable and its rate is not high. In Dr. Röll's well-known Encyklopädie des gesamten Eisenbahnwesens, under the article "Fahrgeschwindigkeit," the daily express mileage is given as 8,058¾ miles, with an average rate of only 30 miles an hour; but, as these figures simply represent the mileage of all trains that the administration are *pleased to style express*, and include a good many trains unworthy the name, they cannot be regarded seriously. Again, the estimate made a few years ago in Foxwell & Farrer's "Express Trains, English and Foreign," only dealt with the services radiating from Brussels to a few of the chief towns, thus omitting all the express mileage not found on their few selected main routes. The only satisfactory way, of course, to discover the *exact* amount of express mileage on any railroad is to discard the public timetables and go direct to the working schedules where one can be quite sure of getting correct times and distances. The booked times of every train should then be scrutinized closely and all train-runs exceeding or attaining a fixed limit of speed from one stopping point to the next should be noted. This process needs, as may be imagined, a vast amount of labor, but once obtained, the figures are correct. For the whole of the Belgian State railroads this method has been adopted, and the results, as taken out by the writer, are undernoted:

No. of separate runs.	Speed.	Daily mileage, at or over 35 m. per h.	Minutes allowed.	Average speed (miles per hour.)
182.....	35 to 40 miles per hour	3,308½	5,418	36.64
44.....	40 to 45 " " "	1,235½	1,789	41.44
16.....	45 to 50 " " "	512	657	46.76
....	Over 50 " " "	.....	.....	....
242..	All over 35 m. per hour	5,056	7,864	38.58

It will be noticed that mainly on account of the meagre amount of really fast speed in Belgium, a minimum speed limit of only 35 miles an hour has been fixed. Had the standard been put at 40 miles an hour the aggregate would have been miserably small, considering the size of the Belgian railroad system, and would have compared most unfavorably with the figures for some of our least progressive English lines which the writer has recently taken out in the manner described above and published separately in book form. There is, of course, no reason why Belgium, with its dense population and level track, should lag behind the most backward of the English railroads, but that it does the following summary most clearly shows. The Belgian figures are taken from the foregoing table:

Railroad.	Approximate length in miles.	No. of separate runs at or over 40 m. p. h.	Daily mileage at or over 40 m. p. h.	Minutes allowed.	Average speed.
South Eastern.	380	72	2,068	2,840	43.69
London, Brighton & South Coast	425	147	3,311¼	4,646	42.76
London, Chatham & Dover	190	91	2,452¾	3,314	44 41
Etat Belge	2,000	60	1,747½	2,446	42.87

A few notes on the working schedule may, in conclusion, prove of interest. This book is about 14 in × 10½ in., and contains 325 pages, 175 of which are occupied with 118 tables, which show the exact working of every train on the system. Passenger trains are shown distinct from goods trains, and a map inside the cover gives reference to the various pages on which the train service may be found. Each table gives distances to the tenth part of a kilometre, and references to other tables are given in those cases where a train performs one part of its journey on one table and the rest on another. Each train has a number, and a list of all these is found in the first few pages of the schedule. The last 150 pages are filled with all sorts of notes and rules for train working.

A run of the Brussels-Ostend morning express, which performs without stop the longest run in Belgium, may fitly close this article:

Distance (miles).	Station.	Actual time.	Remarks.
		H. M. S.	
	Brussels (Nord).	9 1 5*	Engine 935 (four-coupled express).
1¾	Laeken.	9 4 38	Load, 135 tons.
3	Jette St. Pierre.	9 7 2	Slow to Laeken.
6¾	Dilbeek.	9 12 56	
10¼	Ternath.	9 16 55	
14¾	Denderleeuw.	9 21 49	
18¾	Alost.	9 27 30	Signals outside Alost.
21¾	Lede.	9 32 15	Checked after Lede.
29½	Quatrecht.	9 42 10	
33	Meirelbeke.	9 46 16	Very slow after Meirelbeke over the curves outside Ghent.
38½	Tronchiennes.	9 55 10	
61½	Bruges.	10 22 3	Slow through Bruges.
71	Oudenburg.	10 34 28	Dead slow over drawbridge after Oudenburg.
75¾	Ostende.	10 43 0*	

* Due times 9:00 and 10:40.

LOCOMOTIVES OF THE BELGIAN STATE RAILROAD.

Tppe No.	Kind of locomotive.	No. of wheels coupled.	Diameter of driving wheels.	Cyl nder dimensions.	No. of tubes.	Total heating surface	Boiler pressure (atmospheres).	Weight on coupled wheels.	Total weight of locomotive in working order.
			In.	In.		Sq. ft.		Tons. Cwts.	Tons. Cwts.
1	Passenger locomotive	4	78 74	16 93 × 22.05	208	973.35	8	26 8	35 10
2*	" " heavy grades.	6	66.93	17 72 × 23.62	226	1,175.87	8	39 10	39 10
5	Passenger locomotive	4	57 09	12 60 × 18.11	145	593.39	8	22 6	31 18
6 (1)	Express locomotive, heavy grades..	6	66.93	19.69 × 23.62	240	1,666.25	10	42 10	55 0
6	" " " "	6	66.93	19 69 × 23.62	236	1,571.87	10	40 18	53 2
11	Tender locomotive, heavy grades...	6	47.24	13 78 × 19.69	147	569 09	11	30 14	30 14
12	Express locomotive, light grades...	4	82 68	19.69 × 23 62	242	1,340.26	10	26 4	49 4
20	Tender locomotive, freight	8	41 34	18 90 × 21.65	251	1,463 11	9	52 8	52 8
.....	" " "	8	41 34	19 69 × 21 65	242	1,592 08	10	60 13	75 7
25	Freight locomotive.	6	51.18	19 69 × 23.62	251	1,297.38	10	43 4	43 4
28	" "	6	58 27	17 72 × 23.62	236	1,175 87	8	35 2	35 2
29	" "	6	51.18	17 72 × 23.62	226	1,175.87	9	34 16	34 16
51	Switching locomotive	6	47.24	14.96 × 18 11	165	660.30	8	30 13	30 12
.....	Express locomotive	4	70 87	18 11 × 24.02		1,182.5	.....	20 10	41 12
.....	" "	4	78 74	17.13 × 24.02	225	1,310.75	9½	28 15	40 18
.....	" "	4	82 68	19 69 × 23.62	276	2,029.28	10	30 14	57 6

* Class 4 the same, but 1 ton heavier.

TECHNICAL.

Manufacturing and Business.

The Kindl Car Truck Co., of Chicago, has been incorporated under the laws of the State of Illinois by Fred P. Vose, J. E. Coursen and R. Berman. The capital stock is $150,000.

The Ensign Mfg. Co., of Huntington, W. Va., has received an order from the Northern Pacific for a No. 1 Russell snow plow. This is in addition to the order for two mentioned in our last issue.

During the month of October the Chicago Pneumatic

Tool Co., 635 Monadnock Block, Chicago Ill., received table orders for 56 machines, hammers, drills and riveters. This company has within the last 30 days doubled its capacity by putting in new machinery, and is still obliged to run day and night. The company has some new machines for rolling and expanding flues.

The McCord journal box and lid, sold by McCord & Co., Old Colony Building, Chicago, have been specified on 300 cars for the Chicago Great Western, 650 cars for the Seaboard Air Line, 250 cars for the Atchison, Topeka & Santa Fe (now being built by Wells & French), 100 cars for the Iowa Central and 200 cars for Nelson, Morris & Co.

The Philadelphia Bridge Works of Pottstown, Pa., have received an order for two turntables for Korea. They will be 40 ft. long and adapted for 40 ton locomotives. Philadelphia Bridge Works steel pivots will be used.

F. H. Reime, of the Davis & Egan Machine Tool Co., Cincinnati, sailed from New York Oct. 28, for Vienna, Austria, where he will make his headquarters while traveling through Austria in the interests of his company.

The Davis & Egan Machine Tool Co. recently shipped a carload of machine tools, consisting of milling, hub and automatic screw machines, and other tools adapted to the manufacture of bicycles, to London, where they will be exhibited at the Crystal Palace Cycle show about Dec. 1. The company is also preparing to make a similar exhibit at the Berlin Cycle Show.

The E. P. Allis Co., Milwaukee, Wis., is building an extension to its South Foundry, the new part to be 85 × 275 ft. and of frame construction. Also, a new machine shop 103 × 150 ft. of brick. Both of these new buildings will be equipped with 30-ton traveling cranes

Contracts have been awarded by the city of Chicago for two new pumping engines, as follows: One 30,000,000-gallon engine to be installed at the Fourteenth street station, to be of the vertical triple expansion type, for which contract has been awarded to the Lake Erie Engineering Works, of Buffalo, and which will cost $83,750, and to be in operation within 10 months from date of order; and one 14,000,000-gallon engine of the horizontal compound type for the Sixty-eighth street station, contract for which was let to the Holly Mfg. Co. for the sum or $45,930, work to be completed eight months from date of contract. The first decision in reference to the awarding of contracts for these pumps was referred to last week.

Iron and Steel.

Alterations and improvements are being made to the Elba Iron Works Department of the Oil Well Supply Co. of Pittsburg, but it is not likely that work will be resumed before the spring of 1898. The plant has been idle for about four years.

The Bristol Furnace of the Bristol (Tenn.) Iron & Steel Co., the recent sale of which to the Home Iron Co., of Bristol, was annulled by the Supreme Court of Virginia, will be again offered for sale Dec. 1. It is understood that the Home Iron Co. has bought about $100,000 of claims against the Bristol Iron & Steel Co.

The small mill of the Lukens Iron & Steel Co. at Coatesville, Pa., which was burned Oct. 4, is being rebuilt by the Pennsylvania Steel Co. The new building, which is to be finished Nov. 10, will have a steel frame covered with corrugated iron.

New Stations and Shops.

The Kansas City, Pittsburgh & Gulf Railroad is building a pier 2,700 ft. long with double track and a warehouse 100 ×1,200 ft. for storage of freight at Port Arthur. The same company is also building a pier of the same length, with single track, for shipments of stone for building jetties at Sabine Pass, Tex. Christie & Low have built a 25 ton derrick on this pier, the stone for the jetties being taken by tugs and lighters to the Gulf of Mexico at the entrance of Sabine Pass.

A Big Day's Run.

The Illinois Steel Co , on Oct. 19, turned out 1,248 tons of rails and billets on the day shift of 12 hours and 1,160 on the night shift, or 2,408 tons in 24 hours. They expected to turn out 47,000 tons in October, beating the world's record.

One Hundred and Forty-ton Crane.

The Newport News Ship Building and Dry Dock Company is erecting at its shipyard a 140-ton crane to be used for placing engines, boilers and other machinery in the war vessels building for the government, and for placing armor plates, some single pieces of which weigh from 40 to 50 tons. The crane will have sufficient reach to cover the entire width of a large cruiser. This crane revolves on a turntable which is supported on a steel foundation about 25 ft. high. This steel foundation is to carry, besides its own weight, the weight of the crane, its machinery, and whatever load may be lifted, which altogether will aggregate 900 tons. The steel support for this crane is being furnished and erected by the Berlin Iron Bridge Company.

THE SCRAP HEAP.

Notes.

The Chicago & Eastern Illinois recently carried out of Chicago, from the yard of Arthur Gournley & Co, a car of lumber which is said to have weighed 85,000 lbs. The lumber measured 39,000 ft.

The Erie Railroad, through the proper officials, has notified the civil authorities that hereafter all tramps taken to jail for trespassing on the company's property shall, with the officer accompanying them, be transported free, and that there will be no cost taxed in the Justice's docket for their arrest.

A severe and widespread snowstorm interupted railroad traffic in Colorado, Oct. 28 and 29. Press dispatches state that on the line of the Rock Island road, near Limon Junction, the track for six miles was covered with snow 20 ft. deep. The telegraph wires were broken down and trains were delayed 48 hours.

On the evening of Oct. 28 a new building for the Young Men's Christian Association was dedicated at the Chicago & Northwestern terminal in Chicago. The building, which has cost $27,000, stands at Forty-first avenue and West Kinzie street and has been erected by the joint contributions of the railroad company and the officers and employees. President Marvin Hughitt gave $3,000 and the company $15,000.

The Massachusetts Railroad Commissioners have approved the plans for the new Back Bay station of the New York, New Haven & Hartford at Dartmouth and Buckingham streets, Boston. The only important changes in the plans as originally described are the addition of a newsroom, a restaurant, a barber shop and a parcel room and an additional entrance on Buckingham street. No changes are recommended in the exterior.

The Wabash Building, at Seventh and Chestnut streets, St. Louis, in which were the general offices of the Wabash Railroad, besides those of many tenants, was destroyed by fire on Oct. 27, some of the occupants barely escaping with their lives. Practically all the records of the engineering office of the Wabash in the building were destroyed. The loss is many hundred thousand dollars. The Sturgis grain elevator at the foot of Indiana street, Buffalo, was burned down on Oct 27; loss $200,000.

The Governor of Georgia, in a message to the Legislature, which is now in session, recommends that the State Railroad Commission have control of the issuance of stocks and bonds of railroads; that all doubt of the authority of the commission to require the erection of stations be removed and that additional power to require the erection of stations be granted; that the commission have power to regulate the interchange of freight and cars in order to secure to shippers the right to route their goods and to prevent discriminations, and that speedier methods be provided of enforcing the orders of the commission to compel railroads to immediately accord to the public rights which are due. The Governor also recommends that the Railroad Commission be given authority over street railroads, with power to regulate fares.

The New York State Railroad Commissioners, observing that in the wreck of Oct. 24 on the New York Central the ends of cars were most damaged, and that emergency tool boxes, which usually are placed in the ends of cars, are of little or no use when they are needed most, have issued a circular to all the railroad companies in the state quoting the law providing that each closed car in use in every passenger train shall be equipped with one set of tools, consisting of an axe, sledgehammer, crowbar and handsaw "to be properly placed so as to be easily removed." The Board calls attention to the law, "and being convinced from observation and report that in a majority of collisions the ends of the cars are most likely to be demolished or injured, thus rendering the tool box useless or unavailable, the Board recommends that the box containing such tools be placed inside in the center of each car, instead of in the end. The Board will enforce this recommendation wherever it is not complied with."

New Steamers for the R. & O.

The engineers and designers of the Bertram Engine Works, of Toronto, Ont., are preparing plans for two new steamers for the Richelieu & Ontario Navigation Co., to run between Toronto and Prescott. The vessels are to be 277 ft. long, breadth of beam, 61 ft., depth, 14 ft. They will have accommodation for 1,500 passengers each and sleeping accommodations for 428.

Contracts for New Coast Steamers.

On Oct. 29 the New York & Cuba Mail Steamship Co. agreed, as a part of its contract with the Post Office Department, to build two new twin screw steamships of between 5,000 and 6,000 tons. The vessels will be about 400 ft. long, 50-ft. beam and have a draft of 20 ft. They must be able to maintain a speed of over 16 knots an hour.

New East River Bridge Contracts.

On Oct. 29 Justice Smyth, of the Supreme Court, refused the application of O'Brien, McBean & McHale for a writ of mandamus to compel Mayors Strong and Wurster and the Commissioners of the New East River Bridge to show cause why the contract for the Brooklyn anchorage should not be given to them. The contract was given to the Degnon-McLean Construction Co.

The Permanent Way of the Jungfrau Railroad.

In an article in the *Schweizerische Bauzeitung*, E. Strub refers to the two sections, about 2 km. each, now in course of construction, between the stations Scheidegg, 6,770 ft.; Eigergletscher, 7,613 ft., and Grindelwaldblick, 9,223 ft. above the sea. The steepest gradient is 25 in 100, and occurs in 87 per cent. of the second section, but not at all in the first section. The highest portion of the railway, viz., 1.6 km. long, is in tunnel with a least radius of 200 m.; the remainder is open with a least radius of 100 m.

The permanent way is heavier than that of other mountain railways with a view to greater safety and less cost of maintenance. Accordingly the train is heavier, and consists of the locomotive with 30 seats weighing 17.1 tons, and a carriage with 50 seats weighing 8.9 tons when full. There are two motors of 125 H.P., each producing a pressure of 3.3 tons on the teeth of each pinion and a speed of 8 5 km. (5.26 miles) per hour. The 4-in. flat bottomed steel rails, 41.5 lbs. per yard, and generally 10.5 m. long, are laid to the meter-gage on steel sleepers 1 m. apart. The rack-rail, also of rolled steel, in the middle between the ordinary rails, is 6¾ in. high, and in lengths of 3.5 m.; accordingly every fourth space between the sleepers is 0.5 m. The rail-head, into which the teeth are cut cold, is 2½ in. broad, decreasing downward to 1½ in., thus admitting the use of forceps brakes, which, when not pressed tight, still prevent the lift of the axle. These are the only brakes used, and the fastenings of the rails have been designed with due regard to this circumstance. Horizontal parts are avoided on the railway in order to prevent counter-pressure on the rack, and even the three stations have gradients of 1.5, 7 and 12.5 in 100 respectively. The complete weight of steel is 74 lbs. per ft.—*Inst. C. E. Abstracts.*

An Austrian Accident and the Responsibiiity.

In June of last year a military train was dispatched from Trieste, in Austria, with several hundred reserve troops. At a station on the route a freight car had been left on a crossing track nearer to the main track than the rules permit, overreaching a "police mark" placed on that track as the limit within which cars may be left. The military train struck this car, threw it from the track and destroyed it, and it scraped along the side of the military train, crushing the feet of four men who had thrust them out of the car doors (freight cars). Two of these men died of their injuries and the other two lost their feet. Hereupon the stationmaster, the switchman and a trackman were prosecuted for "crime against safety of life" and condemned by the court of first resort. An appeal was made to the Court of Appeals, the condemned employees pleading that the accident was due to overwork, and that the soldiers suffered from their own negligence in sticking their feet out of the cars, though they had been warned not to by their captain. Actually no soldiers within the cars were hurt. The Court of Appeals decided that this did not justify their negligence, and confirmed the condemnation by the lower court.

A Railroad for Costa Rica.

Some time ago the Costa Rica Congress authorized a preliminary survey of the Pacific Railroad. This was carried out by a commission directed by Mr. Albert Gonsalez, Chief of the Road Department of Public Works, for the government. The survey, which occupied six months, was completed a year ago. The Congress has approved the report of the Commission and has issued a decree that the road be built over the route proposed. The executive is also empowered by the decree to make contracts for the road and for works for the improvement of the port at Tivives, on the Gulf of Nicoya, the terminal of the line. It is estimated that the cost of building the railroad will be $5,020,000. Tivives possesses no natural harbor, but the Commission reports that it could be made a good port at a cost of about $1,500,000.

Government Railroading and Horse Sense.

German wheelmen have been complaining that when they dispatch their bicycles on the railroad, the destination cards (which are pasted on all baggage in Germany) are usually stuck on the mud-guards or even the saddles, which, to say the least, is not pretty. After considering these complaints, the Halle general office has recommended that the wheelman provide their bicycles with a plate, card or pocket, tied or strapped on, specially for the purpose of receiving the address card; and it remarks that if they do not do this, they must not complain if the cards are pasted wherever a place for them can be found. Apparently it has not occurred to anyone that the railroads might use a stiff card with a string to it and tie it on the handlebar, as is done on some roads here, where the consecutive numbering of the card and the coupon greatly facilitates the delivery of the wheels.

LOCOMOTIVE BUILDING.

We understand that the Cleveland, Cincinnati, Chicago & St. Louis will buy 20 new locomotives.

The Quebec Central, which has bought four new locomotives this year, contemplates ordering two more.

The Baldwin Locomotive Works are building three locomotives for the San Francisco & San Joaquin Valley Railroad.

The Choctaw, Oklahoma & Gulf has placed an order with the Baldwin Locomotive Works for one consolidation locomotive.

The New York Central & Hudson River Railroad has placed an order with the Schenectady Locomotive Works for 10 locomotives. This is in addition to the order for the same number referred to in our issue of October 1.

The Pittsburgh Locomotive Works are building two more engines for the Union Railway, a branch of the Pittsburgh, Bessemer & Lake Erie, connecting the Duquesne, Braddock and Homestead works of the Carnegie Steel Co.

Mr. Irving Wheatcroft, Vice-President and General Manager of the Colorado Valley Railway, which is now being built from Sweetwater to Austin, Tex., a distance of about 75 miles, will be in the market for locomotives in the near future. Mr. Wheatcroft's office is at Sweetwater, Tex.

CAR BUILDING.

The Duluth & Iron Range is reported as in the market for new equipment.

The Kansas City, Fort Scott & Memphis is in the market for 200 box cars.

The Quebec Central contemplates buying four or five new passenger cars.

Pullman's Palace Car Co. is building two passenger cars for the Mexico, Cuernavaca & Pacific.

The South Baltimore Car Works are building 18 freight cars for the Norfolk, Virginia Beach & Southern Railroad.

The Colorado Valley Railway, referred to in the Locomotive Building column, will shortly be in the market for both freight and passenger cars.

The St. Louis Southwestern has ordered 100 freight cars from the St. Charles Car Co. in addition to the order for 200 noted in these columns Sept. 10. In the 100 cars just ordered there is but one change in the specifications, the Smith Safety coupler being specified.

The San Francisco & San Joaquin Valley Railroad has placed an order with the Ensign Mfg Co., of Huntington, W. Va., for 100 box cars. They will be of 60,000 lbs. capacity and equipped with Janney couplers, Westing-

house air brakes, National hollow brakebeams and Winslow roofs.

The 100 box cars and 100 stock cars being built for the Cincinnati, New Orleans & Texas Pacific by the Ohio Falls Car Mfg. Co., of Jeffersonville, Ind., as mentioned in our issue of Sept. 24, will be of 60,000 lbs. capacity and equipped with Buckeye trucks, Westinghouse air brakes and Sterlingworth brakebeams. The cars are to be delivered during November and December.

The Omaha, Kansas City & Eastern has placed orders with Pullman's Palace Car Co. for two baggage cars, two combination mail and passenger cars, one 60 ft. mail car, two second class coaches, six combination chair and parlor cars and 300 60,000 lbs. capacity C., B. & Q. standard coal cars. Janney couplers, Westinghouse air brakes and National brakebeams will be used on all the cars, and Pullman standard trucks under the passenger equipment. This is the equipment for which this road was in the market some time ago, as noted in these columns at that time.

The Canadian Pacific has recently built at its Montreal shops a new dining car, the Frogmore. It is 70 ft. long over body, 76 ft. 10 in. over platforms, and 9 ft. 10½ in. wide over frame, and is equipped with narrow vestibules, Trojan center-line couplers and McKeen carrying irons. The car body is sheathed in mahogany, finished in natural wood, and is mounted on 6-wheel trucks, equipped with Krupp's 40-in. steel-tired wheels, M. C. B. standard 4¼×8-in. axles and National hollow brakebeams. The interior of the car is finished in mahogany. Chairs made of mahogany and upholstered in bronze green leather are used in place of regular seats. The car is also furnished with a Baker heater.

BRIDGE BUILDING.

Athens, Pa.—The contract for a 110-ft. steel wagon road bridge, with 18 ft. roadway, to be built across Cayuta Creek has been let to the Owego Bridge Co. at its bid of $1,729.

Beaver, Pa.—The Overhead Bridge Co. took steps on Nov. 1 to have viewers appointed to appraise the land on each side of the Beaver River that will be needed for the abutments and approaches for the new bridge between Beaver Falls and New Brighton.

Boston, Mass.—The contract for building three sections of the Charleston approach to the Charleston Bridge, bids for which were received by the Boston Transit Commission Oct. 21, has been given to Dennis F. O'Connell, Boston, at $67,393.

Buffalo, N. Y.—The contract for the superstructure of the new bridge at Cazenovia Park has been given to the Buffalo Bridge & Iron Co. at $5,654, and that for the masonry, to Burgard & Steinwacks at $9,429.

Dover, Ky.—In the building of new Black Diamond Railroad considerable bridge work will be required. The road will apply to Congress next month for authority to build several of the larger ones. Mr. L. C. Carter will have charge of the bridge work, with headquarters at this place.

Hamilton, Ont.—The City Council has decided to build a high level bridge which will cost $25,000.

Harrisburg, Pa.—The court has sustained the report of the Viewers for the Birmingham bridge, which will cost about $2,800.

Lancaster, Pa.—The contract for the iron work of the bridge over Pequea Creek has been let to the Masillon Bridge Co., at its bid of $1,999.

Lincoln, Ill.—It is stated that the City Council has ordered the Chicago & Alton to build a viaduct, estimated to cost $10,000, over Delavan street.

Millplain, Conn.—The contract for a new steel bridge across Mill River has been given to the Wrought Iron Bridge Co., at $1,977.

Ottawa, Ont.—There is not a bridge of any kind left over the Nation River in Cambridge township, Russell County, owing to their destruction by recent fires.

Peoria, Ill.—The St. Louis, Peoria & Northern has asked the City Council that it be allowed to build a bridge over the Illinois River at Liberty street.

St. Thomas, Ont.—The engineers of the counties of Elgin and Middlesex, having examined the bridges which cross the River Thames, between those counties have decided that it is necessary to replace the Coyne road bridge by a steel superstructure.

Scranton, Pa.—The petition for a bridge over Whitney's Creek in West Abington Township will be considered on Nov. 4.

Tilsonburg, Ont.—James Bell, of St. Thomas, is preparing plans for a steel bridge over Big Otter Creek at this place for the Tilsonburg, Port Burwell & Pacific. It will be 600 ft. long.

Wilkes-Barre, Pa.—The Grand Jury has recommended that 52 iron and stone bridges be built in different parts of the county. It has also recommended that if there be a balance in the bridge fund after appropriations have been made for the 52 bridges it be used to bridge over a branch of Toby's Creek between the boroughs of Dorranceton and Kingston, the bridge to be an iron structure costing $10,000.

MEETINGS AND ANNOUNCEMENTS.

Dividends.

Dividends on the capital stocks of railroad companies have been declared as follows:

Kansas City Suburban Belt, 1 per cent., payable Dec. 1.

Kansas City, St. Louis & Chicago, quarterly, preferred, guaranteed, 1¼ per cent., payable Nov. 1.

Pittsburgh, Virginia & Charleston, 2½ per cent., payable Nov. 1.

Stockholders' Meetings.

Meetings of the stockholders of railroad companies will be held as follows:

Brooklyn City & Newtown, special, to consider the lease of the railroad to the Coney Island & Brooklyn, New York, Dec. 1.

Technical Meetings.

Meetings and conventions of railroad associations and technical societies will be held as follows:

The *American Society of Civil Engineers* meets at the House of the Society, 127 East Twenty-third street, New York, on the first and third Wednesdays in each month, at 8 p. m.

The *Association of Engineers of Virginia* holds its formal meetings on the third Wednesday of each month, from September to May, inclusive, at 710 Terry Building, Roanoke, at 8 p. m.

The *Boston Society of Civil Engineers* meets at 715 Tremont Temple, Boston, on the third Wednesday in each month, at 7:30 p. m.

The *Canadian Society of Civil Engineers* meets at its rooms, 112 Mansfield street, Montreal, P. Q., every alternate Thursday, at 8 p. m.

The *Central Railway Club* meets at the Hotel Iroquois, Buffalo, N. Y., on the second Friday of January, March, May, September and November, at 2 p. m.

The *Civil Engineers' Club of Cleveland* meets in the Case Library Building, Cleveland, O., on the second Tuesday in each month, at 8 p. m. Semi-monthly meetings are held on the fourth Tuesday of each month.

The *Civil Engineers' Society of St. Paul* meets on the first Monday of each month, except June, July, August and September.

The *Denver Society of Civil Engineers* meets at 3 Jacobson Block, Denver, Col., on the second Tuesday of each month except during July and August.

The *Engineers' Club of Columbus, (O.)*, meets at 12½ North High street, on the first and third Saturdays from September to June.

The *Engineers' Club of Minneapolis* meets in the Public Library Building, Minneapolis, Minn., on the first Thursday in each month.

The *Engineers' Club of Philadelphia* meets at the House of the Club, 1122 Girard street, Philadelphia, on the first and third Saturdays of each month, at 8 p. m., except during July and August.

The *Engineers' Club of St. Louis* meets in the Missouri Historical Society Building, corner Sixteenth street and Lucas place, St. Louis, on the first and third Wednesdays in each month.

The *Engineers' Society of Western New York* holds regular meetings the first Monday in each month, except in the months of July and August, at the Buffalo Library Building.

The *Engineers' Society of Western Pennsylvania* meets at 410 Penn avenue, Pittsburgh, Pa., on the third Tuesday in each month, at 7:30 p. m.

The *Locomotive Foreman's Club* meets every second Tuesday in the clubroom of the Correspondence School of Locomotive Engineers and Firemen, 335 Dearborn street, Chicago.

The *Montana Society of Civil Engineers* meets at Helena, Mont., on the third Saturday in each month, at 7.30 p. m.

The *New England Railroad Club* meets at Wesleyan Hall, Bromfield street, Boston, Mass., on the second Tuesday of each month.

The *New York Railroad Club* meets at 12 West Thirty-first street, New York City, on the third Thursday in each month, at 8 p. m.

The *North-West Railway Club* meets on the first Tuesday after the second Monday in each month, at 8 p. m., the place of meeting alternating between the West Hotel, Minneapolis, and the Ryan Hotel, St. Paul.

The *Northwestern Track and Bridge Association* meets at the St. Paul Union Station on the Friday following the second Wednesday of March, June, September and December, at 2.30 p. m.

The *St. Louis Railway Club* holds its regular meeting on the second Friday of each month, at 3 p. m.

The *Southern and Southwestern Railway Club* meets at the Kimball House, Atlanta, Ga., on the third Thursday in January, April, August and November.

The *Technical Society of the Pacific Coast* meets at its rooms in the Academy of Sciences Building, 819 Market street, San Francisco, Cal., on the first Friday in each month, at 8 p. m.

The *Western Foundrymen's Association* meets in the Great Northern Hotel, Chicago, on the third Wednesday of each month. A. Sorge, Jr., 1533 Marquette Building, Chicago, is secretary.

The *Western Railway Club* meets in Chicago on the third Tuesday of each month, at 2 p. m.

The *Western Society of Engineers* meets in its rooms on the first Wednesday of each month, at 8 p. m., to hear reports, and for the reading and discussion of papers. The headquarters of the Society are at 1736 1739 Monadnock Block, Chicago.

Engineers Club of St. Louis.

The club met at 8 p. m. Oct. 20, with President Flad in the chair. Twenty-four members and four visitors were present.

The club was entertained by the exhibition of a large number of stereopticon views, showing the various kinds of river improvement work used on the Mississippi and Missouri rivers. Views of dikes, levees, wing-dams and devices for protecting the banks of rivers were shown. Mr. J. A. Ockerson pointed out the features of interest in the different views and explained the uses and methods of construction of the various dikes, levees, dams, etc. This collection of views belongs to Prof. D. L. Turner of Harvard University.

Mr. Wm. H. Bryan gave a short talk on "The Methods of Testing the Efficiency of a Heating System." He briefly explained the different systems of heating and reviewed the methods of testing heating systems that had been proposed by different writers. Mr. Wm. Kent, of New York, and Messrs. Flad, Borden, Johnson and Kinealy took part in the discussion which followed.

Engineers' Club of Philadelphia.

A business meeting of this Club will be held on Nov. 6, at which a paper on "Some Features of Stone Road Construction" will be presented by Mr. Benjamin Franklin.

The meeting which was held Oct. 16 was called to order by Vice-President Henry Leffmann.

AMERICAN BREAKWATERS.

Mr. Louis Y. Schermerhorn presented the paper of the evening on "Breakwater Construction on the American Coast," and illustrated his remarks by drawings and photographic views projected by the electric lantern.

It is difficult to estimate, except approximately, the force or impact of breaking waves, but observation and experience have shown that in some cases the forces have exceeded 4,800 lbs., and have probably reached 6,000 lbs. per square foot. The height and force of impinging waves at any locality depend upon the speed and duration of winds, the depth of the water, the *fetch* or distance over which the waves move, and the angle of incidence at which they strike the breakwater. Previous to the laying of the first Atlantic cable, an effort was made to collate the most reliable information upon the height of waves, with the result that 50 ft. was decided upon as the maximum value.

Since the wave-action which it is necessary to arrest by a breakwater does not extend to a great depth below the surface of the water, the superstructure and the upper part of the substructure are the effective parts of the breakwater, and are subjected to the most destructive action of the waves. Generally the necessary dimensions of these two parts determine the dimensions for the remainder of the work; and while the superstructure must resist severe wave-action, it must also preserve the needed tranquillity of the areas behind it by being carried to a height sufficient to prevent waves being thrown unduly over the top of the structure. Experience upon American breakwaters has shown that the depth to which energetic wave-action extends is about 12 or 15 ft. below the water's surface, and this depth is therefore assumed as the approximate *plane of rest* for the material which is used. For breakwaters in tidal waters the position of this plane must vary with the amplitude of the tide.

The sea slopes of a random stone breakwater must, therefore, be divided into three parts: (1) the part below the plane of rest, (2) the part between the plane of rest and the surface of the water, and (3) the part above the surface of the water; while on the harbor side but two divisions of the slope need consideration, namely, that above and that below the water surface. On the sea face below the plane of rest the random stone will assume a slope coincident with the angle of repose of the material unaffected by the wave action; on the part between the plane of rest and the surface of the water the slope will be formed by wave action, modified by the dimensions of the stone; while above the surface of the water, on both faces of the work, the slopes will be artificial, and dependent upon the size of the stones and the care with which they are laid.

Under American experience and practice the general slopes of the several parts of breakwaters are as follows:

Sea face below the depth of 12 to 15 ft., 1 on 1 to 1 on 1.5.

Sea face from 12 to 15 ft. depth to low water, 1 on 3.

Sea face from low water to top of superstructure, 1 on 0.7 to 1 on 1.

Harbor face from bottom to low water, 1 on 1 to 1 on 1.3.

Harbor face from low water to top of superstructure, 1 on 0.7 to 1 on 1.

The superstructure usually has a width on top of about 20 ft; and upon the two most recent works, namely, the breakwater for the National Harbor of Refuge in Delaware Bay, now in progress, and the proposed breakwater for the Harbor of Refuge in Southern California, at San Pedro, the top of the superstructure is placed at a height of 14 ft. above the plane of low water. With these dimensions and the slopes above given, the breakwaters at these localities attain a width of about 40 ft. at the plane of mean low water; and 12 ft. lower, at the assumed plane of rest, the width is about 90 ft.

The methods of depositing the stone in the three different sections of a breakwater were then described in detail, one of the latest improvements cited being the method now in operation upon the new breakwater in Delaware Bay, where the material below the assumed plane of rest, as well as a part above this plane, is transferred to the work in dump scows of 1,400 tons capacity and specially arranged construction, whereby the entire load is released at once, without the intervention of labor or machinery, and is deposited *en masse*, through the bottom of the scows, directly upon the width of section where the material is wanted.

The general subject of breakwater construction was discussed by Mr John Birkinbine, who exhibited and described a series of photographs of the concrete breakwater at the harbor of Marquette, on Lake Superior; by Mr. James Christie, who asked for information as to whether a cheaper material than stone (for example, twigs, willows, etc.) has ever been used below the plane of rest; and he was advised that in our waters it would be inapplicable unless the brush could be sunk in the sand or otherwise protected from the destructive seaworm; by Prof. Edgar Marburg, who called attention to the hardship laid upon the engineer by the government furnishing specifications and maps of soundings which are not made accurate to date, and require the engineer to determine for himself the character of the bottom before boing able to make reliable plans or estimates; and by Prof Walter L. Webb, who called attention to the movement of the timber construction in the breakwater at Oswego, N. Y.

PERSONAL.

—Mr. M. B. Cutter, formerly superintendent of the Pittsburgh Division of the Baltimore & Ohio, with headquarters at Pittsburgh, Pa., and who resigned that office Sept. 1, has been appointed Superintendent of Transportation of the Lehigh Valley, with office at South Bethlehem, Pa.

—General James Longstreet, of Georgia, has been appointed by President McKinley as Commissioner of Railroads, to succeed Mr. Wade Hampton, resigned. General Longstreet was graduated from the West Point Military Academy in 1842. He served through the Mexican war, and through the Civil war on the Confederate side. Since the last war he has held a number of positions under the Government.

—Mr. H. W. Tracy, Superintendent of the Pine Grove Division of the Philadelphia & Reading, with headquarters at Pine Grove, Pa., died suddenly at his home in that place Oct. 31. Mr. Tracy was appointed Superintendent of the Lebanon & Tremont and Schuylkill & Susquehanna branches of the Philadelphia & Reading in 1870, the above-named branches having been since consolidated into the Pine Grove Division.

—Mr. C. W. Haskins, who was elected Comptroller of the Central of Georgia last January in order to reorganize the system of accounts of that road, has resigned, and has been succeeded by Mr. H. A. Dunn, who was made Auditor of the Central of Georgia last February. Mr. Dunn's headquarters will be at Savannah, Ga. Previous to his connection with the Central of Georgia, Mr. Dunn was Assistant Auditor of Disbursements of the Atchison, Topeka & Santa Fe.

—Mr. John Dunn, formerly Assistant to the President and Assistant Secretary of the Illinois Central, with headquarters at Chicago, Ill., died at Mercy Hospital, in that city, Oct. 30. Mr. Dunn was born at Barnstaple, Devonshire, England. He came to this country 28 years ago and entered railroad service in November, 1874, as Secretary to the President of the Illinois Central. In November, 1880, he was made Assistant Secretary of the same company, holding that office until January, 1883, when he was made Assistant to the President and Assistant Secretary. Mr. Dunn resigned this office about a year and a half ago on account of ill health.

—Mr. Charles F. Smurr, Freight Traffic Manager of the Pacific System of the Southern Pacific, with headquarters at San Francisco, Cal., died in that city Oct. 31. Mr. Smurr was born in Ashland County, O., and entered railroad service as clerk in the local freight office of the Pittsburgh, Cincinnati & St. Louis, at Columbus, O., being subsequently transferred to the Chicago office of that road, where he remained two years. From 1872 until 1874 he was Cashier of the Central Pacific at San Francisco, and from 1874 until 1875 was Commercial Agent of the same road at Salt Lake City, Utah. In 1882

he was appointed Assistant General Freight Agent of the Southern Pacific, with headquarters at San Francisco, and retained that office until November, 1889, when he was made General Freight Agent of the Pacific system of lines in Oregon of the same company. Mr. Smurr was appointed Traffic Manager of the Pacific system last July.

ELECTIONS AND APPOINTMENTS.

Baltimore & Ohio.—Thomas Mason, heretofore Assistant Chief Clerk in the office of the Superintendent of Motive Power and Machinery, of the Atchison, Topeka & Santa Fe, has been appointed Chief Clerk in the mechanical department of this road, with headquarters at Baltimore, Md. E. P. Mobley has been appointed Division Engineer of Maintenance of Way, with headquarters at Grafton, W. Va., to succeed H. E. Hayes, resigned.

Central of Georgia.—H. A. Dunn, Auditor, has been elected Comptroller, with headquarters at Savannah, Ga., to succeed C. W. Haskins, resigned.

Chesapeake & Ohio.—George H. Hammond, formerly Traveling Agent for the Norfolk & Western, with headquarters at Columbus, O., has been appointed Commercial Agent for this road, with office at Pittsburgh, Pa.

Colorado Midland Railway.—Pursuant to the reorganization of this road, referred to in another column, the following officers have been elected and assumed jurisdiction Oct. 31: Geo. W. Ristine, President and Manager, Denver, Colo.; B. Aymar Sands, Vice-President, New York, N. Y.; Henry T. Rogers, General Solicitor, Denver, Colo.; L. G. Cannon, Assistant to the President and Comptroller, Denver, Colo.; Oscar Bunke, Secretary and Treasurer, 41 Wall street, New York, N. Y.; Lewis B. Johnson, Assistant Secretary, Denver, Colo.; B. H. Bryant, General Superintendent, Colorado Springs, Colo.; A. P. Tanner, General Freight Agent, Denver, Colo.; W. F. Bailey, General Passenger Agent, Denver, Colo.; W. S. Wing, Auditor, Denver, Colo.; W. R. Freeman, Cashier and Tax Commissioner, Denver, Colo.; A. L. Humphrey, Superintendent Motive Power, Colorado City, Colo.; C. N. Davids, General Storekeeper, Colorado City, Colo.; H. B. Moore, Chief Surgeon, Colorado Springs, Colo.; Central Trust Co. of New York, Registrar, 54 Wall street, New York, N. Y. All the officers and employees now in the service of the Receiver of the Colorado Midland Railroad will continue to perform their duties until otherwise ordered.

At an adjourned meeting of the directors, held in New York Oct. 28, Charles A. Otis, of New York, and Charles Boettcher, of Denver, Colo., were elected directors, to succeed George Bertine and Lewis B. Johnson, resigned.

Columbus, Hocking Valley & Toledo.—W. E. Joyce, heretofore Chief Clerk in the passenger department of the Baltimore & Ohio Southwestern, at Cincinnati, O., has been appointed Chief Clerk in the passenger department of this company, to succeed T. C. Peck.

Elgin, Joliet & Eastern.—C. S. McManus, heretofore Superintendent of Transportation, has been appointed Superintendent, with headquarters at Joliet, Ill. The office of Superintendent of Transportation has been abolished.

Kansas City, Pittsburgh & Gulf.—At the annual meeting of stockholders, held in Kansas City, Oct. 28, Messrs. Norman B. Ream and Frank O. Lowden were elected Directors.

Lehigh Valley.—M. B. Cutter, formerly Superintendent of the Pittsburgh Division of the Baltimore & Ohio, at Pittsburgh, Pa., has been appointed Superintendent of Transportation of this company, with office at South Bethlehem, Pa. Mr. Cutter will report to the General Superintendent and will have authority to issue instructions in all matters relating to transportation, movement of trains, distribution of cars and assignment of motive power.

Missouri & Iowa Southern.—At a meeting of the stockholders, held at Sedalia, Mo., Oct. 25, the following Directors were elected: O. C. Drew and C. S. Penfield, Houston, Tex.; A. L. Strang, S. C. Gold and James Humphrey, of Sedalia, Mo.; T. C. Pennington, Chicago, L. J. Hamner, Miami, Mo.; J. E. House, Omaha, Neb., W. M. Walker, Marshall, Mo. At a subsequent meeting of the Directors, officers were elected as follows: President, O. C. Drew; Vice-President and General Manager, A. L. Strang; Secretary and Treasurer, S. C. Gold; Chief Engineer, J. E. House; General Attorney, James Humphrey.

Pennsylvania.—P. B. Prince, heretofore Chief Clerk in the Legal Department, has been appointed Assistant to the General Solicitor. The appointment took effect Nov. 1.

Pittsburg, Bessemer & Lake Erie.—H. T. Porter has been appointed Engineer of Maintenance of Way, with office at Greenville, Pa., to succeed George W. Sykes, assigned to other duties. The appointment took effect Oct. 15.

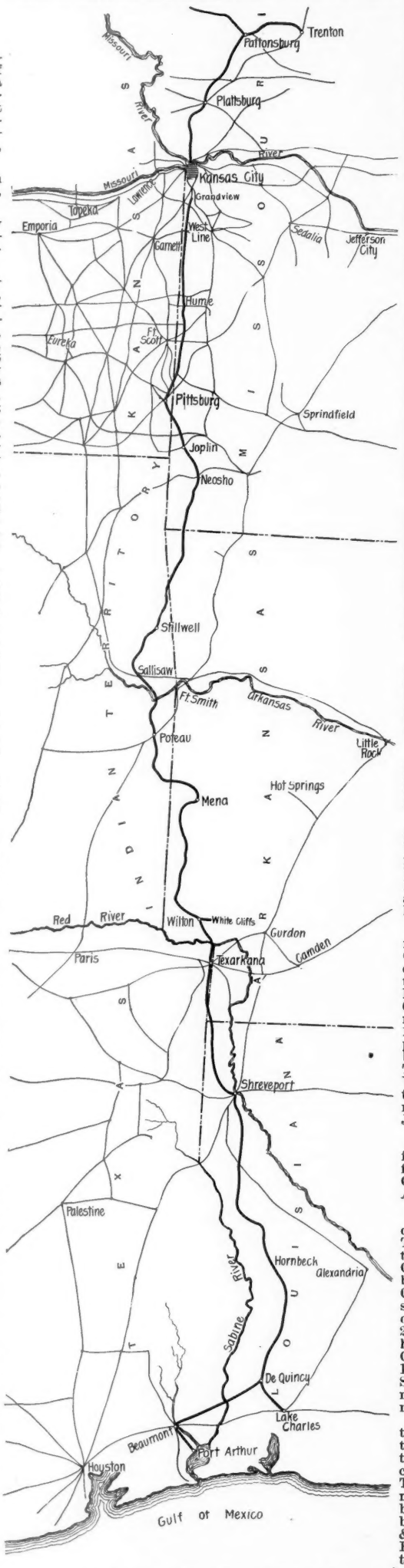
St. Louis, Chicago & St. Paul.—Henry W. Gays, General Manager of the Chicago, Peoria & St. Louis, has, in addition, been appointed to the same office with this company, with headquarters at Springfield, Ill. The appointment is made in accordance with the general plan of consolidating the interests of these two companies.

Savannah & Statesboro.—The Directors of this newly incorporated road, referred to in another column are as follows: Stilson Hutchins, Washington, D. C. A. H. MacDonnell, Wm. R. Leaken, J. R. Saussy, Jr., of Savannah, Ga.; Ellen Wood, T. E. Robertson, Lee Hutchins, Thos. W. Buckley and Chas. A. Douglass.

Toledo & Northwestern—The incorporators of this company, whose incorporation was noted last week, are as follows: Gilson E. Murdock, Albert E. Owen, R. Corcoran, Louis F. Wright, Luther H. Joy and E. L. Owen, all of Albion, Mich., and Sam. A. Williams, of Cleveland, O.

RAILROAD CONSTRUCTION,
Incorporations, Surveys, Etc.

Astoria & Columbia.—Surveys have been completed and work is rapidly progressing on the extension of this road from Astoria, Or., along the south shore of the Columbia River, through Svensen's, Knappa, Clifton, Westport, Marshland, Clatskanie, Maygers and Rainier, to a connection with the Northern Pacific at Goble, 60.3 miles. The main contractors are Honeymann, De Hart & Glenn, of Rainier, and the bridge contractors Wakefield & Jacobson, of Astoria. All work is to be completed under contract by June 1, 1898. Between 1,000 and 1,100 men are now at work. The work is easy; the roadbed is located at about high water on the Columbia River, with practically no grades. There are four curves along the line, each of 7 deg. There are five drawbridges: One of wood, at Warrenton, length 74 ft., and four of steel, crossing Young's Bay at Astoria, length



Line of the Kansas City, Pittsburgh & Gulf.

290 ft.; John Day's River, east of Astoria, length 148 ft.; Blind Slough, near Knappa, length 180 ft.; Clatskanie River, at Clatskanie, length 180 ft. The first three are completed, the fourth nearly and the fifth partly completed. There are 6.5 miles of trestling along the water front through Astoria. The present line, formerly known as the Seashore, runs from Seaside northeast 18.3 miles to Astoria. J. R. Jamieson, Astoria, Or., is Engineer-in-Charge.

Atchison, Topeka & Santa Fe.—The line of the Santa Fe Pacific from Albuquerque, N. M., to The Needles is being thoroughly renewed. New steel is rapidly going into track, ballast is being placed along the line, the roadbed widened and strengthened, bridges renewed with steel and permanent water supply provided by a series of reservoirs and pipe lines. Important improvements are also being made on all the tracks of this line in Southern California. No arrangements have been made as yet for connecting this line with the San Francisco & San Joaquin Valley, although officials state that this would be a natural arrangement and that the new road has not yet been sufficiently developed to make the connection necessary.

Since July 1 this company has laid about 45 miles of 75-lb. rails between Marceline and Lexington Junction, Mo., on the Chicago Division. Also about 18 miles of 65-lb. rails on the line between Arkansas City, Ark., and Purcell, Kan. (See this column for Sept. 27.)

Chattanooga Southern.—First mortgage bonds for $500,000 to the Union Trust Co. of New York have been filed and the money will be used for building the extension from Gadsden, Ala., south 115 miles to Montgomery (see this column for March 19). The present road extends from Gadsden north 92 miles, to Chattanooga, Tenn. W. S. Hoskins, of Chattanooga, Tenn., is General Manager.

Chicago, Burlington & Quincy.—This company is reported to have filed a plat in the United States land office at Rapid City, S. D., for its proposed extension of the Deadwood Central from Deadwood, 4⅛ miles up Split Tail Gulch to Two Bit Mining Camp.

Chicago, Indianapolis & Louisville.—It is reported that this company has purchased all the land needed to extended the Chicago & Southeastern from Anderson, Ind., east to Muncie, 20 miles. This road was recently purchased by the Chicago, Indianapolis & Louisville (see this column for Oct. 8) and extends from Anderson Junction west to Waveland Junction, 81 miles, with a branch of 19 miles to Sands Creek, Ind., to Brazil. The property was taken possession of Nov. 1.

Colorado & Northwestern.—Grading is rapidly progressing under the contract of Orman & Crook, of Pueblo, Col., to complete the road by Dec. 15. The grading has been completed to Sunset, a distance of eight miles. Track is being laid in the yards at Boulder and the bridges are being made ready on the main line in the cañon. The road as projected is to extend from Boulder northeast 26 miles to Ward and Spring Gulch. E. C. Thompson, Meadville, Pa., is President. In connection with this company has been organized the Pennsylvania Milling & Mining Co., to build at Boulder a reduction mill with a daily capacity of 150 tons.

Colorado Valley.—Track has been laid on the first division of five miles and grading is in progress on the second five-mile division of this projected road from Sweetwater, Tex., southeast toward San Antonio and Austin. The company has other contracts to let. Irving Wheatcroft, Sweetwater, Tex., is Vice-President and General Manager.

DeLassus & Farmington Railway Co.—This company has been incorporated in Missouri with a capital stock of $40,000 to build a line in St. Francois County from DeLassus, a point on the St. Louis, Iron Mountain & Southern, northeast three miles to Farmington.

East McKeesport.—This company was incorporated in Pennsylvania Oct. 29 with a capital stock of $35,000 to build a line in Allegheny County from McKeesport, Pa., northeast 3½ miles, to Wilmerding. The Directors are: W. B. Armstrong, President; Curtis Mitchell, T. W. Durker, Pittsburgh, Pa.; R. F. Ramsey, J. P. Cavenaugh, W. H. Hegerman, Allegheny; Walter Roe, Sewickley, Pa.

Glade Creek & Raleigh.—Last year 27 miles of this road, running west from Hinton, W. Va., a point on the Chesapeake & Ohio, were completed, and at present the company has under construction five miles additional, to the intersection of the Big Beaver & Piney Creek. The line is projected for an indefinite distance up Piney Creek. The section of the line under construction has maximum curves of 8 deg. and maximum grades of 1½ deg. The work is very light, being down a comparatively straight creek valley, and is being done entirely by the company's forces. There are no iron bridges. This road is owned by the Beaty Lumber Co., of Crow, W. Va., and is being built to develop their white pine timber and coal lands. It is a narrow gage, but a movement is on foot to standard gage it in the near future. J. L. Lancaster, of Crow, is Chief Engineer.

Kansas & Southeastern.—It is reported that a large force of men has been put to work at grading this line from Honeywell, Kan., southwest 18⅓ miles to Parker, Oklahoma. Among those interested is Francis S. Eaton, Arkansas City, Kan.

Kansas City, Pittsburgh & Gulf.—With the recent completion of the connecting link between Beaumont, Texas and De Quincey, La. (see this column for Sept. 17), this company now operates a direct line from Kansas City south to Port Arthur, Tex., 789 miles, besides a branch from De Quincey southeast 21 miles to Lake Charles, and another branch from Milton, Ark., east seven miles to White Cliffs. The northern terminus of the line owned by the company is Grand View, Mo., 23.62 miles south of Kansas City, but trackage rights have been acquired into Kansas City over the Kansas City, Osceola & Southern from Grand View north to Belt Junction, 11.62 miles, and over the Kansas City Suburban Belt from Belt Junction into Kansas City, 12 miles. This makes a total of 793 miles owned and 816 miles operated by the company.

Connections north of Kansas City are to be made through the Kansas City & Northern Connecting (see this column for Sept. 10 and Oct. 8), which is owned by the Kansas City Suburban Belt, through which it makes connection with the Kansas City, Pittsburgh & Gulf. The Kansas City & Northern Connecting is in operation north to Smithville, 22 miles from which point it is building an extension of 52½ miles north to Pattonsburgh, where connection will be made with the Omaha & St. Louis Division of the Omaha, Kansas City & Eastern for Omaha, Neb., 145 miles northwest from Pattonsburgh. The gap of 35 miles from Pattonsburgh east to Trenton was completed by the Omaha, Kansas City & Eastern last June (see this column for July 2), which gives direct connection by the Quincy, Omaha & Kansas City Division for Quincy, Ill., 170 miles east of Pattonsburgh.

Building was begun on the present Kansas City, Pittsburgh & Gulf by the Kansas City, Nevada and Fort Smith, which was chartered Nov. 6, 1887, and completed the road from Grandview south to Hume, Mo., 57.5 miles, on Oct. 1, 1891. The roads purchased were the

Kansas City, Fort Smith & Southern from Joplin, Mo., south to Sulphur Springs, Ark., 51 miles, in 1893; the Texarkana & Fort Smith, from Winthrop, Ark., south to Texarkana, 34 miles, in 1894, and the Calcasieu, Vernon & Shreveport, in 1897, which road has been made standard gage to complete the branch from De Quincey to Lake Charles, La. The name was changed to the present title Jan. 26, 1893. The sections from Mena, Ark., to Horatio, from Many, La., to De Quincey, and from De Quincey to Beaumont, La., in all 193 miles, have been completed this year.

Lehigh Valley.—Regular train service was begun on the portion of the new Seneca County branch between Rochester and Waterloo, N. Y., Oct. 26. The extension as projected is to extend from Seneca Falls, west, to Geneva Junction, eight miles.

Long Island.—Application has been made by this company to the Brooklyn and New York Boards of Aldermen for permission to tunnel under certain streets in those cities in connection with the general plan for the depression of tracks and for the tunnel under the East River. A public hearing on the application will be given in Brooklyn on Nov. 12 and in New York on Nov. 29.

Mobile & Ohio.—It is stated that over 90 per cent. of the grading has been completed on the extension of this road from Columbus, Miss., southeast 168 miles to Montgomery, Ala., and that track has been laid for 25 miles from Columbus, and eight miles from Montgomery. The bridge at Tuscaloosa will probably not be completed for three months, but it is believed that within five months the entire extension will be ready for operation.

New York & Pennsylvania.—At a meeting of the stockholders, held at Hornellsville, Oct. 29, it was decided by unanimous vote to increase the bonded indebted indebtedness by $60,000, the proceeds to be used in building extensions from Canisteo, N. Y., northwest about eight miles to Hornellsville and from Oswayo, Pa., northwest to Olean, 42 miles. The new bonds will be four per cent. gold 20-year bonds. Franklin D. Sherman, of Hornellsville, and Fred. C. Leonard, of Coudersport, have been appointed trustees to negotiate the sale of the bonds. J. B. Rumsey, Oswayo, Pa., is General Manager.

Oregon Short Line.—It is stated that Deal & Mendenhall, of Springville, Utah, have obtained a contract for grading the Y at Lehigh Junction, which is to extend from a point on the main line north of the Union depot, about 1¼ miles. It is expected that grading will be completed in about 25 days.

Pontiac Pacific Junction.—Engineers of this company have completed their surveys of the proposed extension from Aylmer, Que., northeast about eight miles on the north bank of the Ottawa River to Hull, and building will be begun at once. This road extends from Aylmer northwest 70.6 miles to Waltham, Que., and is subsidized by the government to be continued across the River to Pembroke. The entire line must be completed July 3, 1898. G. C. Dunn, Ottawa, Ont., is Acting Chief Engineer.

Quebec Central.—This company is daily expecting the delivery of 2,000 tons of 70 lb. rails from the Carnegie Steel Co., which, with a portion of the stock on hand, will enable it to relay 20 miles of road from Thetford Mines station north to Tring Junction. In addition the company is improving the ballasting of such portions of the road as need it, and this portion of the work will be completed some time during the month. Frank Grundy, Sherbrooke, P. Q., is General Manager.

St. Louis, Siloam & Southern.—It is reported that active work has been begun at Pomona, Mo., on this road, which is projected to run from St. Louis southwest about 350 miles to Fort Smith. H. D. Mackey, of St. Louis, is President.

St. Louis Southwestern.—Johnston Bros. & Fraught, of St, Elmo, Ill., have been given the contract to build the Gray's Point Terminal extension of the St. Louis Southwestern from Delta, Mo., east 16 miles to Gray's Point, on the Mississippi River, five miles below Cape Girardeau. (See this column for Sept. 10.) The work is progressing rapidly.

San Francisco & San Joaquin Valley.—Grading has been completed from Stockton, Cal., south to the north line of Kern County, 190 miles, and tracklaying from Stockton to Angiola, 175 miles. The branch from Fresno northwest 45 miles to Visalia has also been completed and regular train service is in operation on that branch and also from Stockton south to Hanford. Tracklaying is now in progress south of Angiola. The work is being done by the company and has not been given to contractors. Surveys are being made from Stockton east to San Francisco. A contract for a tunnel 5,700 ft. long is to be let within a month and a contract for grading 40 miles in Kern County from the north line to Bakersfield will be let this week. W. B. Storey, Jr., San Francisco, is Chief Engineer.

Savannah & Statesboro.—This company has been incorporated in Georgia as the successor to the Cuyler & Woodburn, which was sold at auction last spring by order of the court. (See these columns for March 19.) The intention is to extend the road about 20 miles northeast from Woodburn to Statesboro. The present road runs from Woodburn, southwest 13 5 miles, to Cuyler, a point on the Central of Georgia. It is also intended to extend the road from Cuyler, east about 20 miles to Savannah, unless arrangements can be made for running trains over the track of the Central of Georgia. The directors of the new company are given in another column.

Sharon Connecting.—This company was incorporated in Pennsylvania, Oct 27, with a capital stock of $10,000, to build a line from a point on the Westermann Coal Railroad, now operated by the Erie, near the Shenango River, in the borough of Sharon, north about 1½ miles, to a point on the Shenango Valley Railroad. The Directors are: F. H. Buhl, President; David Adams, Beryl Preston, W. F. May, all of Sharon, Pa.

Shreveport & Red River Valley.—The City Council of Shreveport, La., has granted the necessary franchises to this company for entering the city. The road as projected is to run from Shreveport, south, along the Red River Valley to Coushatta, La., 64 miles. It is reported that grading has been begun at Loggy Bayou, 20 miles below Shreveport. W. C. Taylor, Shreveport, La., is among those interested. (See this column for Aug. 6.)

Union Pacific.—This company has about completed the relaying of 135 miles of 56 and 60-lb. rails on the Nebraska Division with new 70-lb. rails. The re-ballasting of that portion of the Nebraska division between Columbus and Grand Island, 62 miles, with disintegrated granite from the mountains between Cheyenne and Laramie, has been completed. The company believes that this material is the best in existence for ballasting track as well as for making floors, station platforms, driveways, roadways, etc. The General Manager states that the material packs together firmly, and in floors and roadways becomes as hard and smooth as concrete.

Washington, Bayfield & Iron River.—This company has about 10 miles of grading completed from Washburn, Wis., west toward Iron River, the entire distance being 26 miles, and will lay rails this fall. The company expects to continue work on the road all winter, which is being carried on under the management of the Bayfield County Construction Co., of which R. D. Pike, Bayfield, Wis., is President. W. F. Dalrymple, of Bayfield, has been given the contract for building the Bayfield branch, which extends north about 13 miles to Bayfield. Of this eight miles are nearly graded and the rails will probably be laid before winter sets in.

Electric Railroad Construction.

Asheville, N. C.—The Asheville Electric Power & Light Co., which was recently organized, will take the property of the West Asheville Electric Improvement Co., and extend the tracks formerly operated by that company.

Baltimore, Md.—The Baltimore, Halethorpe & St. Denis Railway Co. has applied to the County Commissioners for an additional franchise to lay tracks on the Rolling road, as far as the Washington road, and also to lay tracks across the bridge over the Patapsco River at that point.

Berlin, Wis.—The right of way for the Oshkosh, Berlin & Urban Electric Railroad, which will be 22 miles in length, has been secured for the entire distance, and the road will be built in the near future.

Boston, Mass.—An effort is being made to induce the West End Street Railway Co. to build a line on Blue Hill avenue, between Franklin field and Walkhill street.

Bradford, Pa.—The Bradford Electric Railway Co. has elected the following Board of Directors: C. A. Richardson, C. E. Barnes, G. E. Rogers, F. E. Lowe, W. B. Ferguson, W. R. Weaver, C. C. Melvin, L. E. Hamsher and C. E. Hudson. C. A. Richardson was elected Vice-President and General Manager to succeed Harry L. Pierce, resigned. F. W. Davis continues as President and C. E. Hudson as Secretary. The line of the above company and the Olean, Rock City & Bradford Railroad will hereafter be operated under the same management. The Superintendent, Mr. Isaac White, has in contemplation several important changes which will improve the service of both roads. The Congress street barn will hereafter be used as a repair shop, all work for the two roads being done in this city instead of at Olean, as heretofore.

Brooklyn, N. Y.—The New York & Queens County Railway Co. has filed a certificate of extension of its route for additional tracks between College Point and Flushing, which includes double tracking some of its present short lines.

Buffalo, N. Y.—An application has been made to the Board of Trustees of East Aurora by the Buffalo, Hamburg & Anoka Railway Co. for permission to build an electric road in East Aurora. On Nov. 1 the Board of Trustees held a public hearing and the road as projected was favored.

Camden, N. J.—The Camden & Suburban Railway Co. has arranged to extend its tracks in Stockton on the River road to the New Cove road.

Canton, O.—A press report states that a franchise has been granted to a stock company to build a trolley line from Canton to Alliance. The route is through Louisville and Maximo, a distance of about 20 miles.

Dallas, Ore.—The work of grading the Falls City & Salem Railroad began last week. The company was formed about six months ago to build this road. Work will probably be pushed to an early completion.

Fostoria, O.—Right of way for a proposed electric line between Fostoria & Toledo, to parallel the Cincinnati, Hocking Valley & Toledo, have been secured.

McKeesport, Pa.—The East McKeesport Railroad Co. was granted a charter last week at Harrisburg to operate an electric railroad from McKeesport to Wilmerding, a distance of five miles, by means of which the Pennsylvania Railroad will secure an entrance into McKeesport. Fast service will be instituted and passengers, mail and express will be carried. N. B. Armstrong, of Pittsburgh, is President.

Milwaukee, Wis.—C. W. Slattery, of Cambridge, Wis., has been granted the contract for grading the bed of the new electric road from North Greenfield to Waukesha. The tracks over this portion of the route will be laid in the spring.

New York.—The State Railroad Commissioners have given a hearing to the Metropolitan Street Railway Co. for its application to change the motive power on four branches of its line.

Northbridge, Mass.—The Worcester & Blackstone Valley Street Railway Co. has been given a hearing in the matter of granting the franchise in the extension of the road from Farnumsville to Rockdale. A decision will be given in a short time.

Norwell Center, Mass.—The Hanover Street Railway Co. has been granted permission to extend its road from Norwell to Norwell Center.

Odessa, N. Y.—Mr. John Hinman, of Addison, writes us that he has just completed the survey for the electric road from Odessa to Ithaca to be known as the Watkins & Ithaca Railroad and to be 28 miles in length. There is no organization at present, Mr. Hinman being the sole promoter.

Prince Bay (S. I.), N. Y.—The Prince Bay Railway Co. has been incorporated with a capital stock of $15,000 to build an electric road from the railroad station to the factory of the S. S. White Dental Mfg. Co.

Schenectady, N. Y.—A committee has been appointed to secure right of way to build an electric road from Schenectady to South Schenectady. The road will probably be built as soon as the necessary funds have been secured.

West Chester, Pa.—The Philadelphia & West Chester Electric Railway Co. is about to extend its line from Newtown Square to West Chester. For some time the extension of the road has been blocked at Newtown Square because of its inability to obtain right of way over part of its proposed route. The company has now decided to run half a mile out of its course, and complete the line.

GENERAL RAILROAD NEWS

Baltimore & Ohio.—There will be a default in the interest payments on the following securities: First mortgage five per cent. bonds of the Baltimore Belt ($6,000,000 outstanding); first mortgage five per cent. bonds of the Akron & Chicago Junction ($1,500,000 outstanding); five per cent. bonds of the Newark, Somerset & Straitsville ($800,000 outstanding). Upon the following securities interest due Nov. 1 will be paid: Maine line sterling six per cent. loan of 1874 ($9,634,500 outstanding); equipment bonds series B. ($800,000 outstanding); first mortgage five per cent. bonds of the Confluence & Oakland ($1,200,000 outstanding); first mortgage five per cent. bonds of the Baltimore & New York (350,000 outstanding); first mortgage four per cent. bonds of the Cleveland, Terminal & Valley ($5,500,000 outstanding).

Holders of first mortgage five per cent. gold bonds of the Columbus & Cincinnati Midland of the Baltimore & Ohio are notified that coupons on these bonds due July 1, 1896, will be paid, together with interest thereon to Oct. 1 at 4½ per cent., upon presentation of trust certificates to the Guaranty Trust & Safe Deposit Co., of Philadelphia.

Holders of consolidated mortgage five per cent. gold bonds due 1988 are notified that they may deposit them with J. P. Morgan & Co., New York not later than Jan. 2 and receive in exchange certificates and deposit to bear interest warrants corresponding to coupons maturing on the bonds for the next five years.

Holders of first mortgage five per cent. gold bonds on the Baltimore Belt Line, due 1990, are notified that they may deposit them not later than Dec. 1, with Brown Bros. & Co., of New York and Philadelphia, and Alexander Brown & Sons, of Baltimore, and receive in exchange negotiable certificates.

Holders of Buffalo & Erie seven per cent. mortgage bonds, maturing April 1 next, are notified that Speyer & Co., New York, have prepared to purchase them at par and accrued interest to date of maturity, less discount at the rate of three per cent. per annum.

Canadian Pacific.—The earnings for September and for the nine months ended Sept. 30 were reported as follows:

September:	1897.	1896.	Inc.
Gross earn	$2,344,529	$1,826,680	$517,848
Oper expen	1,284 638	1,068,452	216,185
Net earn	$1,059,891	$758,228	$301,663
Nine months:			
Gross earn	$16.396,340	$14,669.593	$1,726.747
Oper. expen	9,750,490	9,288,362	462,128
Net earn	$6,645,850	$5,381,231	$1,264,619

Arrangements have been made to issue in London $1,000,000 bonds preferred stock at four per cent. to cover the cost of building the Crow's Next Pass extension.

Chesapeake & Ohio.—The earnings for September and for the three months ended Sept. 30 were reported as follows:

September:	1897.	1896.	Inc.
Miles oper	1,360	1,360	.....
Gross earn	$937,823	$869,854	$67,969
Oper. expen	614,095	570,499	43,596
Net earn	$323,728	$299,355	$24,373
Three months:			
Gross earn	$2,901,930	$2,572,165	$329,765
Oper. expen	1,895,570	1,678,095	217,475
Net earn	$1,006,360	$894,070	$112,290

Chicago, Burlington & Quincy.—The earnings for September and for the three months ended Sept. 30 were reported as follows:

September:	1897.	1896.	Inc.
Gross earn	$4,411,242	$3,161,549	$1,249,693
Oper. expen	2,381,650	1,794,885	586,765
Net earn	$2,032,592	$1,369,664	$662,928
Fixed charges	890,000	876,202	13,798
Surplus	$1,142,592	$493,462	$649,130
Three months:			
Gross earn	$11,311,314	$9,032,166	$2,279,148
Oper. expen	6,513,561	5,368,529	1,145,032
Net earn	$4,797,753	$3,663,637	$1,134.116
Fixed charges	2,670,000	2,628,606	41,394
Surplus	$2,127,753	$1,035,031	$1,092,722

Chicago, Milwaukee & St. Paul.—The earnings for September and for the three months ended Sept. 30 were reported as follows:

September:	1897.	1896.	Inc.
Miles operated	1,648	1,648	.....
Gross earn	$3,210,896	$2,878,179	$332,717
Oper. expen	2,058,003	1,867,065	190,938
Net earn	$1,152,893	$1,011,114	$141,779
Three months:			
Gross earn	$8,704,904	$7.948,772	$756,132
Oper. expen	5,510,047	5,271,032	239.015
Net earn	$3,194,857	$2,677,740	$517 117

Colorado Midland Railway.—At midnight, Oct. 31, in pursuance of the decree of the Circuit Court of the United States for the District of Colorado, George W. Ristine, Receiver, transferred the property of the Colorado Midland to the newly incorporated Colorado Midland Railway Co. This road was sold at foreclosure Sept. 9. (See this column for Oct. 15.) The new officers are given in another column.

The Busk-Ivanhoe tunnel was abandoned after the transfer of the property, and men were immediately put at work tearing up the track connection. All trains now go over the Hagerman Pass. This tunnel was built for the use of the Colorado Midland, but the tunnel company refused to accept the reorganized company and in consequence the old line has been repaired over the Hagerman Pass.

Erie.—The earnings for the three months ended Sept. 30 were reported as follows:

Three months:	1897.	1896.	Inc.
Gross earn	$7,483,563	$7,009,743	$473,820
Oper. expen	5,144,137	4,909,504	234,633
Net earn	$2,339,426	$2,100,239	$239,187
Other income	165,457	5,451	160,006
Total	$2,504,883	$2,105,690	$399,193
Fixed charges	2,250,458	2.052,275	198,183
Surplus	$254,425	$53,415	$201,010

Detroit & Lima Northern.—A mortgage for about $2,000,000 has been filed in Detroit, Mich., with the Manhattan Trust Co., New York, for five per cent. 50-year bonds. Of this $300,000 is to be used in obtaining terminals at Detroit, $100,000 to purchase the Dayton Northern, $12,000 per mile for track, acquiring when

built $3,000 a mile for equipment and $3,000 for each mile used by track agreement. In case the Lima Northern is purchased $1,200 000 of the bonds is to be given for liquidation of the Lima Northern bonds and $170,000 for finishing the equipment and tracks of that road.

Greenwood, Anderson & Western.– United States Circuit Court Judge Simonton, at Columbia, S. C., Nov. 1, ordered the sale of this road in response to the demand of the creditors, among whom are W. B. Strang & Co., of New York, contractors. Herbert Sass was appointed Special Master, and the road will be sold at the upset price of $125,000, at a time to be set by the Master. This company was organized to build an extension of the Carolina Central which it leased, from Seivern, S. C., north 66 miles to Batesburg and Greenwood. About 15 miles of this extension was completed when work ceased and the lease of the Carolina Central was canceled. (See this column for Feb. 5.)

Lehigh Valley.—The earnings for September and for the 10 months ended Sept. 30 were reported as follows:

September:	1897.	1896.	Inc. or Dec.
Gross earn	$1,742.675	$1,817,569	D. $74,894
Oper. expen	1,219,827	1,261,937	D. 42,110
Net earn	$522.848	$555.632	D. $32 784
Coal Co. (loss)	35,613	41,093	D. 76,709
Total net earn	$487,235	$596,728	D. $109,493
Ten months:			
Gross earn	$15,054,882	$15,450,630	D. $395,748
Oper. expen	11,638.370	12,221,703	D. 583,333
Net earn	$3 416 512	$3,228.9 7	I. $187,585
Coal Co. (loss)	332,860	(loss) 540,502	D. 207,642
Total net earn	$3,083,652	$2,688,425	I. $395,227

Louisville & Nashville.—The earnings for September and for the three months ended Sept. 30 were reported as follows:

September:	1897.	1896.	Inc. or dec.
Gross earn	$1.864 873	$1,755,696	I. $109,177
Oper. expen	1,209,015	1,214,096	D. 5,081
Net earn	$655,858	$541,600	I. $114,258
Three months:			
Gross earn	$5 438,433	$5,024,084	I. $404,349
Oper. expen	3,560,592	3,531,968	I. 28.624
Net earn	$1,877,841	$1,502,116	I. $375,725

Mexican Central.—The earnings for September, and for the nine months ended Sept. 30, were reported as follows:

September:	1897.	1896.	Inc. or dec.
Gross earn	$880,407	$863,121	I. $17,286
Oper. expen	691,989	567,917	I. 124,072
Net earn	$188,418	$295,204	D. $106,786
Nine months:			
Gross earn	9,406,792	7,396,146	I. 2,010,646
Oper. expen	6.603,003	4,765,208	I. 1,837,795
Net earn	$2,803,789	$2,630,938	I. $172,851

New York & Ottawa.—A certificate of consolidation of the Northern New York with the New York & Ottawa was filed with the New York Secretary of State, Oct. 28. The Northern New York was recently purchased by this company and extends from Tupper Lake, N. Y., north to Moira, 56.1 miles. (See these columns for Oct. 8.) Extensions of this road are now in progress from Moira nortt to the St. Lawrence, 15.4 miles, and from the St. Lawrence to Ottawa, 58.7 miles. The directors of the consolidated company are: George Foster Peabody, Henry Sanger Snow, Alexander M. White, Jr., of Brooklyn; George Barclay Moffat, Spencer Trask and A. Burnham Moffat, of New York; Charles B. Hibbard, of St. Albans, Vt.; Charles J. Peabody, of Englewood, N. J., and George S. Madden, of Boston.

Norfolk & Western.—The earnings for September and for the three months ended Sept. 30 were as follows:

September.	1897.	1896.	Inc. or Dec.
Miles oper	1,570	1,570	
Gross earn	$1,023,303	$864,846	I. $158,457
Oper. expen	665,344	778,563	D. 113,219
Net earn	$357,959	$86,283	I. $271,676
Three months:			
Gross earn	$2,927,283	$2,627,648	I. $.99,635
Oper. expen	1,955,478	2,134,657	D. 179,179
Net earn	$971,805	$492,991	I. $478,814

Pennsylvania.—The earnings for September and for the nine months ended Sept. 30 were reported as follows:

September:	1897.	1896.	Inc. or Dec.
Gross earn	$5,859,639	$5,176,339	I. $683 300
Oper. expen	3 709,728	3,371,728	I. 338,000
Net earn	$2,149,911	$1,804,611	I. $345 300
Nine months:			
Gross earn	$46,788,773	$46,161,173	I. $627,600
Oper. expen	32,057,657	33 349,457	D. 291,800
Net earn	$14,731,116	$12,711,716	I. $919,400

Peoria, Decatur & Evansville.—Holders of first mortgage and second mortgage bonds are notified that the limit of time for their deposit with the New York Security & Trust Co., representing the Reorganization Committee, has been extended to Dec. 1. (See this column for Oct. 22.)

Philadelphia & Reading.—The earnings for September and for the three months ended Sept. 30 were as follows:

Sep'ember:	1897.	1896.	Inc. or Dec.
Gross earn	$2,021,275	$1,841,757	I. $182,518
Oper. expen	1,042,323	1,012,975	I. 29,348
Net earn	$981,952	$828,782	I. $153,170
Coal & Iron Co	86,607	105,622	D. 19 015
Reading Co	28,446	28,446	
Total net earn	$1,097,005	$962,850	I. $134.155
Fixed charges	$745,000		
Surplus	$352,005		
Three Months:			
Gross earn	$5,879,108	$5,381,589	I. $147,819
Oper. expen	3,144,625	3,026,113	I. 18,512
Net earn	$2,684,783	$2,355,476	I. $329 307
Coal & Iron Co	355,447	236,353	I. 119,094
Reading Co	87.134	87,134	
Total net earn	$3,127,364	$2,678.963	I. $448,401
Fixed charges	2,235,000		
Surplus	$892,364		

Pittsburgh, Cincinnati, Chicago & St. Louis.—Bonds of the Jeffersonville, Madison & Indianapolis Division of this line to the number of 224 have been drawn by a lot for redemption at 110, with interest, at the office of the Farmers' Loan & Trust Co., of New York. Interest has ceased on all bonds not presented by Nov. 5.

St. Louis & San Francisco.—The earnings for September and for the three months ended Sept. 30 were reported as follows:

September:	1897.	1896.	Inc.
Gross earn	$625,111	$541,520	$83,591
Oper. expen	319.478	281,740	37,738
Net earn	$305,633	$259,780	$45,853
Three months:			
Gross earn	$1,768,913	$1,545,985	$212,928
Oper. expen	967,598	834,709	132,889
Net earn	$801,315	$711,276	$80,039

Southern Pacific.—The earnings of the Pacific system for September and for the three months ended Sept. 30 were reported as follows:

September:	1897.	1896.	Inc.
Gross earn	$3,446,000	$2,888,437	$557,563
Oper. expen	1,766,000	1,707.418	58.582
Net earn	$1,680,000	$1,181,019	$498,981
Three months:			
Gross earn	$10,150,141	$8,421,087	$1,729.054
Oper. expen	5.348,142	4,978,762	369,380
Net earn	$4,801,999	$3,442,325	$1,359,674

Tacoma, Lake Park & Columbia.—This road was sold to Colonel Bailey at public auction at Tacoma, Wash., Oct. 21, for $10,000. The road runs from Tacoma to Lake Park, Wash., 11.5 miles, with a projected extension from Lake Park to the Columbia River, 135 miles. It was chartered in March, 1892, and a receiver appointed in March of 1894.

Toledo, St. Louis & Kansas City.—Judge Taft, of Toledo, O., has denied the motion of the first mortgage bondholders for decree and foreclosure of the sale of this road. This committee consists of John C. Havemeyer, H. O. Armour, R. B. Hartshorne, O. T. Bannard and Morton S. Patton, with whom about $8,300,000 of bonds have been deposited. Testimony on behalf of the creditors will be taken in New York soon before the Special Master, and at the close of the hearings the boadholders will have their right to renew their motion for the decree of foreclosure.

Union Pacific.—The sale at public auction of the government second mortgage and sinking fund of this road took place before Master in Chancery Cornish in front of the Union Pacific freight-house, Omaha, Neb., on Monday morning, Nov. 1. The only bidder was Gen. Louis Fitzgerald, who made his bids in the name of A. W. Kreck and himself for the Reorganization Committee. The entire bid was $52,528,532.76, of which $39,883,281.87 was for the mortgage and $13,645,250.89 for the bonds held in the sinking fund. In addition there is $4,036,400 of cash held in the sinking fund which reverts to the government. This covers the entire indebtedness to the government on the Union Pacific proper, a statement of which is as follows:

Debits:		
Principal of debt	$27,236 512.00	
Interest paid to Sept. 30, 1897	30,830,886.37	
Interest unpaid to Sept. 30, 1897	286,147.68	
Interest accrued in October	95,382.56	
Total debits		$58,448,928 61
Credits:		
Cash and bonds in sinking fund	$18,182,466.53	
Estimated additions for four months to Nov. 1, 1897	384,180.21	
Total credits		$18,565 646.74
Net amount due		$39,883,281.87

On Nov. 2 the Reorganization Committee, through General Fitzgerald, purchased at the same place the first mortgage bonds for $50,637,435, the minimum price. The sale of the Kansas Pacific has been postponed from Nov. 6 to Dec. 15 by order of Judge Sanborn at St. Paul, Minn., upon the motions of ex-Governor Hoadley and General Cowin. On Oct. 30 Judge Sanborn heard arguments on three motions for foreclosure of mortgages on the Central, the Atchison, Colorado & Pacific, and the Atchison, Jewell County & Western branches of the Union Pacific, and referred the case to Master of Chancery W. D Cornish to report facts and the form of decree by Dec. 6.

Holders of certificates from the Reorganization Committee are called upon to pay the third and last installment of five per cent. of the nominal par value of the certificates to the Mercantile Trust Co., New York, on or before Nov. 24.

Wabash.—The earnings for September and for the three months ended Sept. 30 were reported as follows:

September:	1897.	1896.	Inc.
Gross earn	$1,262 508	$1,060,030	$142,478
Oper. expen	804,151	723,198	80,953
Net earn	$398,357	$336,832	$61,525
Three months:			
Gross earn	$3,391,324	$3,168,733	$222,591
Oper. expen	2,215,678	2,163,858	51,820
Net earn	$1,175,646	$1,004,875	$170,771

Wheeling & Lake Erie.—A preliminary assessment of one per cent. on the stock is being paid at the Central Trust Company's office, New York, to reimburse the committee for the advance of $80,000 used to pay interest to the first mortgage bondholders Oct. 5 and to provide a fund to meet other contingencies.

Electric Railroad News.

Brooklyn.—A meeting of the stockholders of the Brooklyn City & Newtown Railroad Co. will be held Dec. 1 for the purpose of considering a lease of all the railroads owned or operated by the company to the Coney Island & Brooklyn Railroad Company for the term of 999 years.

The gross earnings of the lines operated by the Brooklyn Rapid Transit Co. show the following results:

October:	1897.	1896.
Brooklyn Heights	$393,099	$376,134
Brooklyn, Queens Co. & Suburban	66,423	62,564
Total	$459,522	$438,698

Chicago.—The Chicago General Railway Co. has been granted a council order in which it is stated that the company is permitted to extend its electric line across private property condemned for the purpose at Thropp and Thirty-first streets, the line to be operated by the West Chicago Street Railway Co. under lease from the Chicago General Railway Co. The charter of the latter company authorizes it to condemn property for the construction of its line.

Montreal, Que.—The total net earnings of the Montreal Street Railway Co. for the 12 months ending September 30 are $507,886. Out of this a 4 per cent. dividend was paid in May last amounting to $160,000, and another in November of 4 per cent. amounting to $166,667. With the latter was a bonus of $41,667, making a total of $368,333. This leaves a surplus of $139,552, which when added to last year's surplus gives a total of $340,245.

Peterborough, Ont.—Our correspondent informs us that a movement is on foot to purchase from the Grand Trunk Railway Co. the line extending to Lakefield and Chemong, with a view to its conversion into an electric road.

Washington, D. C.—On Oct. 21 the Columbia & Maryland Street Railway Co. passed into the hands of a syndicate of Baltimore capitalists composed in part of some of the projectors of the road, and it is stated that the work along the line, which has been suspended for many months, will be resumed shortly.

TRAFFIC.

Traffic Notes.

A soft coal rate war is reported in Ohio From the Ohio mines to Detroit, the Detroit & Lima Northern and the Ohio Southern have made a reduction of 45 cents a ton.

It is announced that an agreement has been entered into between the Hamburg American Steamship Company and the Grand Trunk Railway for a regular monthly service between Hamburg and Portland, Me.

The New York papers report that all the steamship space for live cattle from New York to English ports has been engaged for a whole year, the contractor being, it is said, a syndicate of English cattle buyers. The rate is reported as 42s. 6d. per head, which is 5s. higher than the price which has ruled for some time past. The average weekly shipments of cattle from New York are about 1,300 head.

The Interstate Commerce Commission, in opinions by Commissioner Prouty, has announced decisions in the cases of the Kentucky Railroad Commission against the Cincinnati, New Orleans & Texas Pacific and the Southern Railway and A. J. Gustin against the Illinois Central and others. In the Kentucky case rates on wheat in carloads to Morristown and other points in Tennessee were higher from Nicholasville, Ky., than from Cincinnati, but the rates from Nicholasville are now not higher than those from Cincinnati. The Commission decides that the former rates were in violation of the long and short haul clause, but that the present charges are not, and that a formal order should not now be issued.

In the Gustin case freight rates from Memphis and New Orleans to Kearney, Neb., made up of rates to and from Omaha, were alleged to be unreasonable and unlawful, but no joint through rates were published or filed. The railroad companies denied that the carriage was continuous and no proof was submitted by complainant showing that the carriers make a through route in fact by their course of business. The decision is that the Commission has no power to compel a through route, and no issue of law or fact having been presented over which the Commission has jurisdiction, the complaint is dismissed.

Chicago Traffic Matters.

CHICAGO, Nov. 3, 1897.

Flour rates, both domestic and export, from the Northwest are now in a hopeless tangle. The Chicago-St. Paul lines last week announced a rate of 20 cents on export flour from Minneapolis to New York. This was followed a day later by the St. Paul & Duluth road naming a tariff, effective Monday, making the all-rail domestic rate 22½ cents, and all the other lines out of Minneapolis hastened to meet the cut. The Chicago lake and rail lines, in order to meet this competition, announced a 15-cent tariff.

The Chicago-St. Paul roads in connection with the Soo line have made a rate on corn from Minneapolis to Boston of 25 cents, which is on the basis of 20 cents to New York.

All commissions on passenger business in the West were by agreement restored to a normal basis on Nov. 1, the Union Pacific agreeing to act in accord with the other roads. It is feared, however, that as far as North Pacific coast rates are concerned the independent action of the Canadian Pacific may prevent the carrying out of the agreement.

At the St. Louis meeting of the executive officials of the Western roads the present pass agreement was reaffirmed for 1898, with a few changes of minor importance to conform to various rulings the chairman has made during the current year.

The Central Passenger Association lines have agreed to make one way round trip fares for land excusions to the South, Nov. 2 and 16 and Dec. 7 and 21.

From Nov. 21 all lines between Chicago and Louisville and Chicago and Cincinnati have agreed to make common running time on both morning and evening trains.

Western roads have authorized homeseekers' excursions for Nov 2 and 16 and Dec. 7 and 21 on the basis of one fare for the round trip, plus $2.

The Burlington road is being loudly complained of at Kansas City because, so the grain men allege, it is diverting Nebraska grain to Chicago and St. Louis. The dissatisfied grain men say that shippers with wheat for Chicago and St. Louis readily get cars, while those desiring to ship to Kansas City are turned away.

Eastbound shipments from Chicago and Chicago junctions to points at and beyond the Western termini of the trunk lines for the week ending Oct. 28 amounted to 62,326 tons, as compared with 64,277 tons the preceding week. This statement includes 22,177 tons of grain, 2,373 tons of flour and 12,932 tons of provisions, but not live stock. The following is the statement in detail for the two weeks:

Roads.	Week Ending Oct. 28.		Week Ending Oct. 21.	
	Tons.	p. c.	Tons.	p. c.
Baltimore & Ohio	3,475	5 6	3,598	5.6
C., C., C. & St. Louis	4,618	7 4	4,494	7.0
Erie	9,855	15.8	9,644	15.0
Grand Trunk	6,966	11.2	8,208	12 8
L. S. & M. S	5,617	9.0	7 649	11.9
Michigan Central	4.983	8 0	6,339	9 8
N. Y., Chi. & St. L	6,550	10 5	5,020	7.8
Pitts., Cin., Chi. & St. Louis	5,986	9.6	4,492	7 0
Pitts., Ft. Wayne & Chicago	8,9 0	14 3	8,213	12.8
Wabash	5,356	8.6	6,620	10 3
Totals	62,326	100.0	64,277	100.0

Lake shipments last week were 134,868 tons.